Consulting Engineer

March 1959

Photo by Fabian Bachrach

J. B. Converse, chairman of the board of J. B. Converse & Co., Inc., Mobile, Alabama, thinks engineers gain from both a business and a professional standpoint by publicly stating their viewpoint, constantly and candidly. "We have no closed doors, or closed meetings, in our firm," Converse said. "We realize that the confidence of the public is necessary for the continued expansion of our work. But unfortunately the engineering

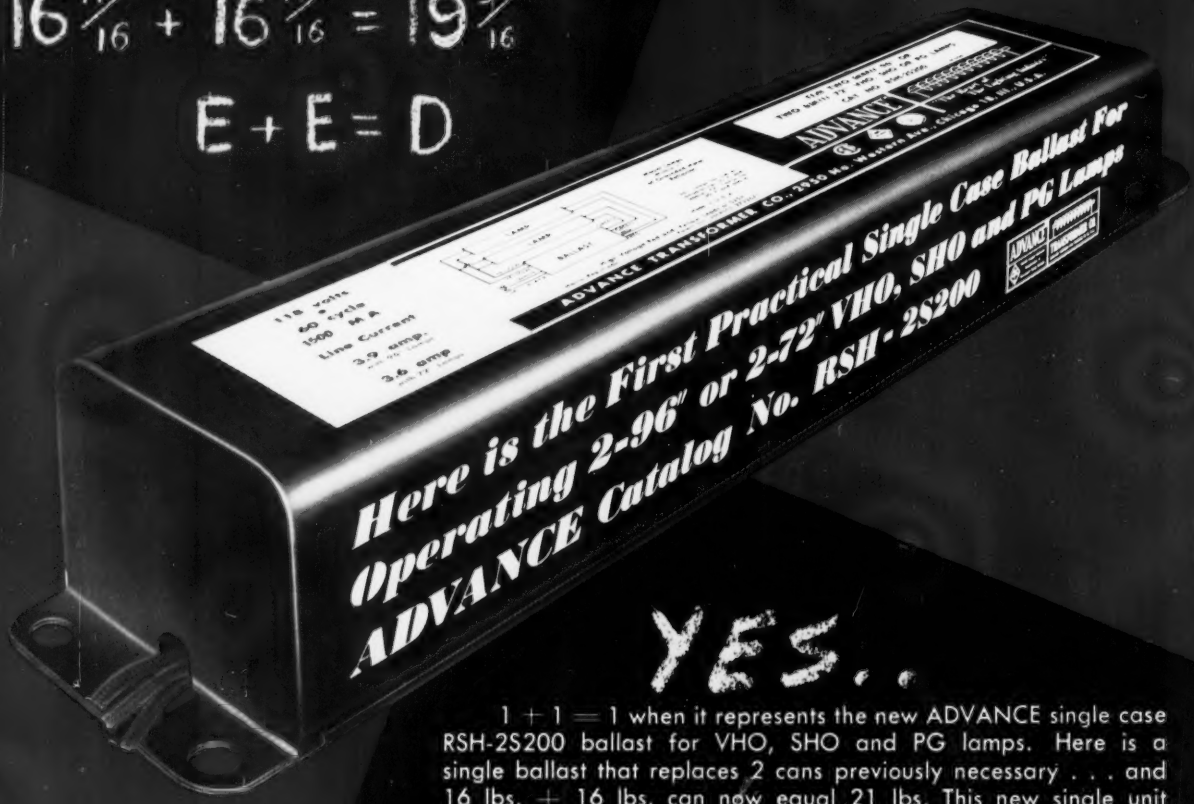
Continued on page 14

NOW 1 + 1 = 1

16 lbs + 16 lbs = 21 lbs

$16\frac{11}{16}'' + 16\frac{11}{16} = 19\frac{3}{16}''$

E + E = D



Here is the First Practical Single Case Ballast For Operating 2-96" or 2-72" VHO, SHO and PG Lamps

ADVANCE Catalog No. RSH-2S200

YES...

1 + 1 = 1 when it represents the new ADVANCE single case RSH-2S200 ballast for VHO, SHO and PG lamps. Here is a single ballast that replaces 2 cans previously necessary . . . and 16 lbs. + 16 lbs. can now equal 21 lbs. This new single unit weighs only 21 lbs., a saving of 11 lbs. over 2 case installations.

16-11/16" + 16-11/16" = 19-3/16". Where two ballasts formerly required almost 3 ft. of channel this new ADVANCE single case unit saves space as it is only 19-3/16" long . . . installing one ballast in place of two cuts labor costs in half.

Then too, E + E = D. ADVANCE engineers have designed this single ballast to operate at a lower sound rating level. Now in place of 2 ballasts of E sound ratings, the new ADVANCE RSH-2S200 ballast is sound rated D. This makes it possible to use VHO, SHO and PG lamps in places where heretofore these installations were unsatisfactory because of ballast noise.

The ultimate service of a ballast depends on its design, construction and operation at low temperature. ADVANCE now brings you a single case ballast for operating two—96" or two—72" VHO, SHO, or PG lamps incorporating these principles. There is no finer ballast . . . none that will operate cooler or longer. Write today for complete technical data.

"The Heart of the Lighting Industry"

ADVANCE

CBM CERTIFIED

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

Salk Hall and campus photo courtesy of University of Pittsburgh.

Famous

SALK HALL

at the University of Pittsburgh to be serviced by Ric-wiL underground piping . . .

Salk Hall is where Dr. Jonas E. Salk and his staff are conducting their continuous virus studies. This ten-story building will eventually become a center for experimental medicine with additional space for research conducted by many faculty members.

Ric-wiL is proud to be a part of this great institution and has, since 1932, supplied the underground steam distribution lines. Over 10,000 feet of Ric-wiL serves an area more than a half-mile long and a half-mile wide.

Over 500 universities, colleges and schools are presently using Ric-wiL Piping Systems.

We invite your inquiry regarding the many types of Ric-wiL Systems available.

Write, wire or phone for complete literature.

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

SINCE 1910

RIC-WIL INCORPORATED

PREFABRICATED **INSULATED PIPING SYSTEMS**

BARBERTON, OHIO

IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

See our catalog in Sweet's

Reliance Boiler Safety for 75 Years

There has always been danger from low water in boilers — even at 50 lbs. pressure! Accidents — *boiler explosions* — did happen back in the days when pressures over 50 psi were considered "high".

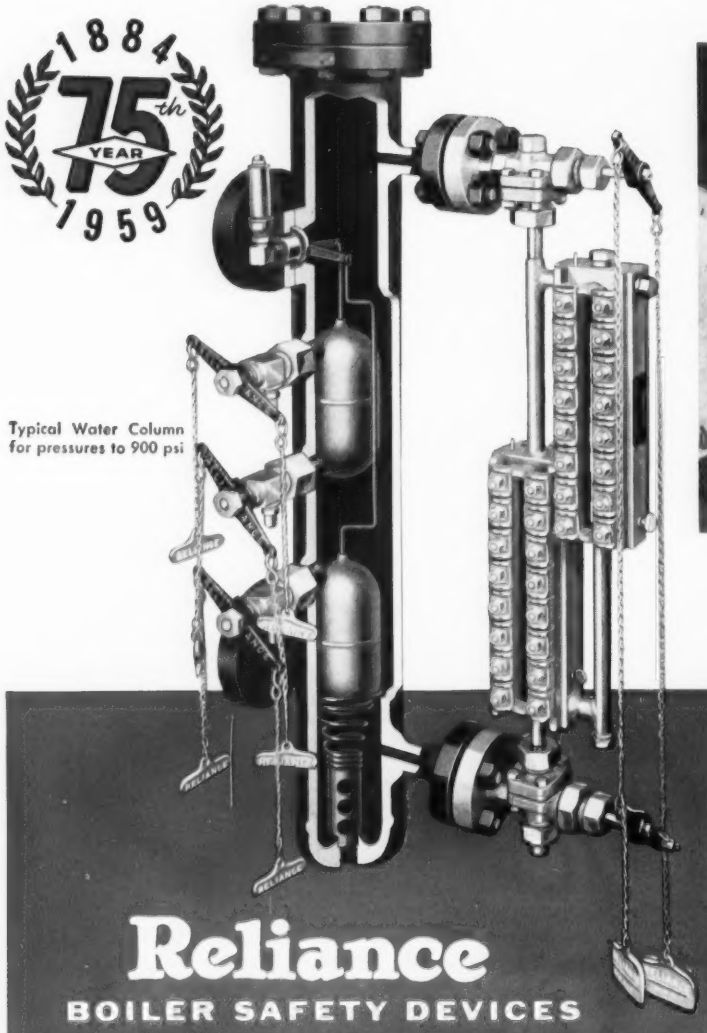
So the Alarm Water Column was invented by a man who recognized the need, and in 1884 Reliance introduced the forerunner of water columns used today in thousands of power plants.

Reliance has kept abreast of the steady rise in working steam pressures with appropriate designs in water columns, with and without alarms. Necessary items for column "trim" — try cocks, gage valves and gage inserts, (also direct-to-drum assemblies) gage illumination, and auxiliary alarms and indicators are offered in various types to suit all needs.

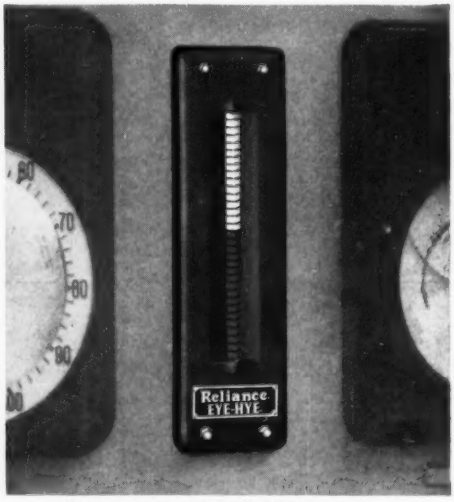
Reliance produced the first compensated remote reading boiler gage in America. The EYE-HYE now serves as an extra safety factor for many thousands of boilers, both stationary and marine. More recently, Reliance electrode-type devices have made it possible to actuate alarms, fuel cutouts, and start and stop pumps on any pressure.

The *originator* of safety water columns, Reliance has been the only manufacturer devoted exclusively to the measurement of boiler water levels for the past 75 years . . . Reliance engineer representatives are located in all principal cities.

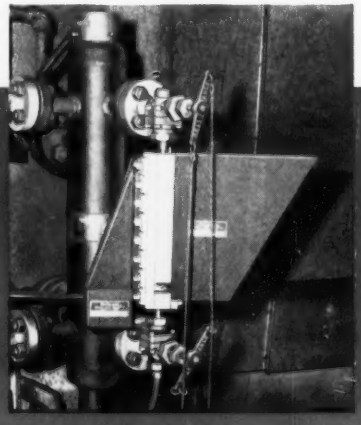
1884 75th YEAR 1959



Typical Water Column for pressures to 900 psi



Above — newly styled EYE-HYE remote gage readable up to 90° either side of center.



Reliance
BOILER SAFETY DEVICES
The Reliance Gauge Column Company, Cleveland 3, Ohio

Consulting Engineer ®

The Consulting Engineer's Professional Magazine

Wayne near Pleasant Street
Saint Joseph, Michigan

March 1959 • VOLUME XII • NUMBER III

ARTICLES

92 Mass Rapid Transit To Serve the Super Cities
Irvan F. Mendenhall

98 New Approach to Dialysis
Louis J. Guarino, P.E. and John R. Guarino, M.D.

104 Pipe in Concrete Need Not Corrode
A. W. Peabody

108 Where to Use a Curtain of Air
Walter Norton

114 America Moved West On The Old National Road
Tom Probst

122 How You Can Negotiate With the Navy
Captain Joseph A. McHenry

126 A Report from London
Julian S. Tritton

DEPARTMENTS

Cover Personality – J. B. Converse
33 Readers' Comment
42 Readers' Guide
48 From the Editor's Tranquil Tower
54 Report from the West Coast
68 Heard Around Headquarters
86 The Legal Aspect
137 Krick Weather Forecast
144 The Word from Washington
158 Field Notes
168 Atoms in Action
178 News for the Consultant
196 Men in Engineering
209 Books
216 New Projects Reported
236 Meetings
288 Advertisers' Index

The Engineering Index Service in Public Libraries lists articles from Consulting Engineer

OFFICE OF THE EDITOR: *Saint Joseph, Michigan*

Hunter Hughes, *Editor* • A. M. Steinmetz, *Managing Editor* • Stewart H. Ross, *Associate Editor* • Florence E. DeWolff, *Editorial Assistant* • Marjorie Oden, *Eastern Editor* (141 East 44th Street, Room 512, New York, N. Y.) • Ralph S. Torgerson, *West Coast Editorial Representative* (7075 Rosemary Lane, Lemon Grove, California) • Philip Reed, *Art Consultant* • John C. Rogers, *Staff Artist*

OFFICE OF THE PUBLISHER: *Saint Joseph, Michigan*

R. W. Roe, *Managing Director* • E. R. Cauley, *Publisher* • Carma Lingle, *Production Manager* Charles E. Cohrs, *Circulation Manager* • Cullen S. Child, *Merchandising Manager*

SALES REPRESENTATIVES

New York: Ted E. Gordon, New York Sales Manager, 141 East 44th Street, Room 512, OXford 7-9677 • *New England and New York State:* John F. Wallace, North Scribner Avenue, South Norwalk, Connecticut, VOlunteer 6-1382 • *Philadelphia:* D. L. McKechnie, 816 Lancaster, Villanova, LAwrence 5-4692 • *Cleveland:* Richard P. Keine, 30113 Wolfe Road, Bay Village, Ohio, TRinity 1-0444 • *Saint Joseph, Michigan:* J. E. Tym, 217 Wayne Street, YUkon 3-5511 • *Chicago:* A. C. Petersen, J. E. Tym, 360 North Michigan Avenue, Room 614, DEarborn 2-3519 • *Los Angeles:* Duncan Scott & Company, 1901 West 8th Street, DUnkirk 8-4151 • *San Francisco:* Duncan Scott & Company, 85 Post Street, GArfield 1-7950 • *Dallas:* Ed Whetzle, 923 Cordova Avenue, DAvis 4-4016.

NBP CONSULTING ENGINEER is published monthly by Consulting Engineer Publishing Company at 217 Wayne Street, Saint Joseph, Michigan. Price 1 year $10.00; foreign $15.00; single copy $1.00. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan.

Copyright 1959, Consulting Engineer Publishing Company.

EPA

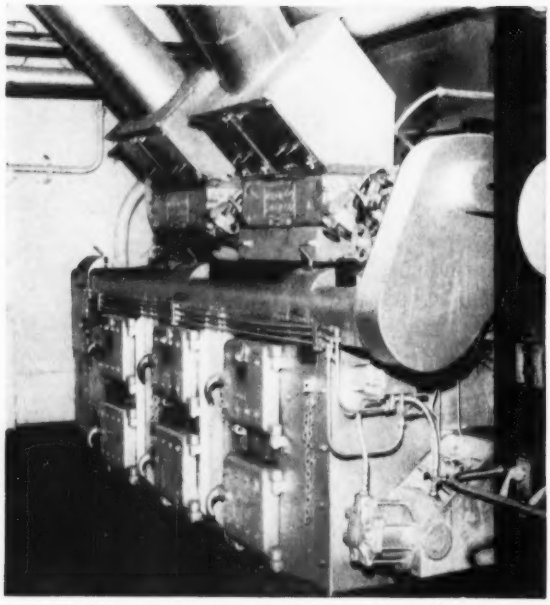
Launching of the Edmund Fitzgerald—largest ship on the Great Lakes. Length 729 ft., beam 75 ft., depth 39 ft., Ore cargo capacity 26,000 gross tons. Owner, The Northwestern Mutual Life Insurance Co. Builder, Great Lakes Engineering Works, at its River Rouge, Mich., yard. Charterer, Columbia Transportation Division of Oglebay Norton Co.

(Wide World Photo)

SS EDMUND FITZGERALD . . .

the 61st Ship equipped with

DETROIT STOKERS



One of 2 Detroit RotoStokers Type CC firing 2 Combustion Engineering Co. bent tube marine boilers in the Fitzgerald. Each boiler is rated at 32,750 pounds steam per hour MCR—36,000 pounds per hour peak. Operating pressure is 470 psig. Total steam temperature is 755°F. Design is for 12,350 BTU bituminous coal with 11.9% ash.

The Str. Edmund Fitzgerald, with Detroit RotoStokers Type CC (continuous cleaning), is the 61st ship in 10 of the Great Lakes fleets to be equipped with Detroit Stokers.

These ships burn coal because it is the most economical fuel . . . burn it on Detroit Stokers because of their high efficiency and dependable operation.

Dependability is important anywhere . . . doubly so on ships where failure at a critical moment would be serious. Stoker efficiency is a first concern of cost conscious ships' crews who compete for operating economy records.

An additional advantage in ship as well as other installations is the fact that the Detroit RotoStoker and the RotoStoker CC can be installed for firing-floor ash discharge if desired, avoiding the use of basement or hold space for ash bunkers.

Efficiency, flexibility, low upkeep and high availability of Detroit Stokers is well known wherever coal is burned.

For the same kind of superior stoker service and economy that was chosen for this giant steamship, let us survey your plant and give you recommendations—without obligation.

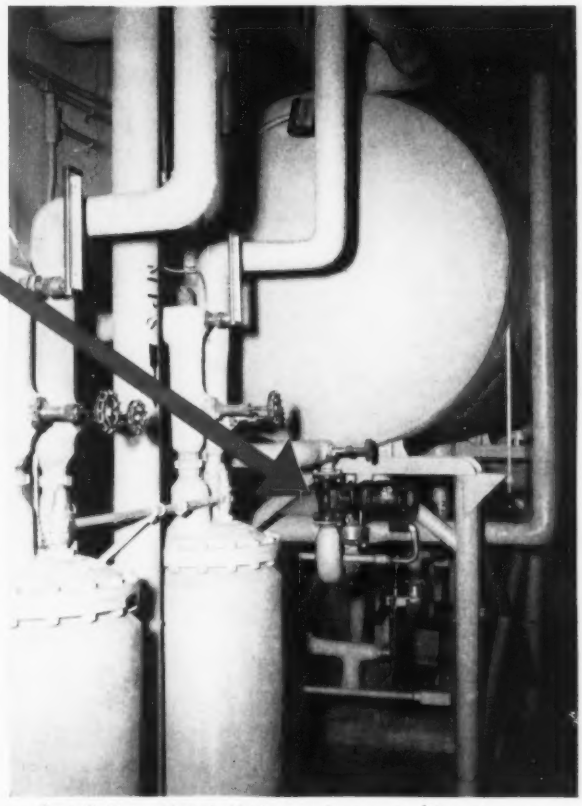
DETROIT STOKER COMPANY

MAIN OFFICE AND WORKS • MONROE, MICHIGAN

District Offices or Representatives in Principal Cities

B&G ALL-BRONZE BOOSTERS

FOR LONG LIFE IN CIRCULATING HOT OR COLD RAW SERVICE WATER FOR FAUCET OR INDUSTRIAL USES

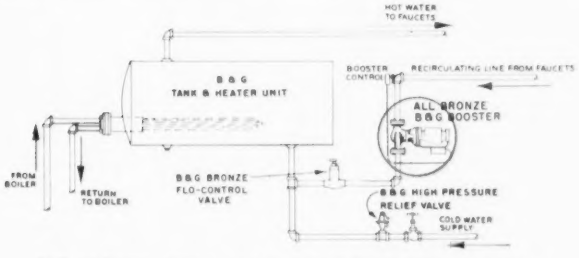


Where hot or cold service water is to be pumped, the use of an all-bronze pump is imperative. Otherwise, the corrosive effects of continuously pumping fresh water materially shortens pump life.

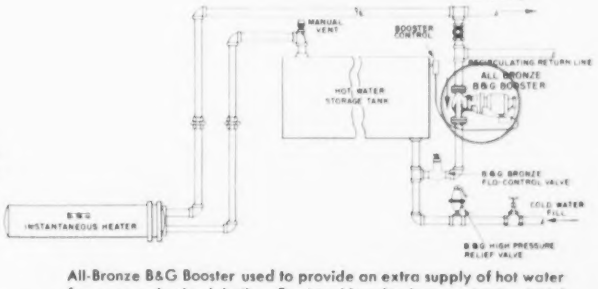
The B&G All-Bronze Booster is specifically built for service water pumping applications. In such systems, the Booster can be installed in numerous ways to step-up efficiency, increase hot water production and reduce heating costs. It is immune to corrosion, hence will give years of dependable service.

For *quiet* operation, failure-proof performance and long life, the B&G Booster is the *preferred* pump.

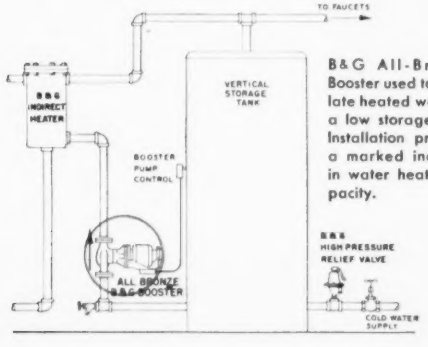
Installation of B&G All-Bronze Booster in Chrysler automatic transmission plant at Kokomo, Indiana. This small unit handles the circulating requirements of the service water heating system.



B&G All-Bronze Booster used on recirculating line from hot water faucets maintains hot water at fixtures at all times. Recommended on all installations, particularly where long plumbing lines are used.



All-Bronze B&G Booster used to provide an extra supply of hot water from an undersized boiler. Semi-tankless hook-up maintains initial supply of hot water.



B&G All-Bronze Booster used to circulate heated water to a low storage tank. Installation provides a marked increase in water heater capacity.

Send for Bulletin No. IA-856

BELL & GOSSETT
COMPANY
Dept. FQ-70, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

NOW! ...a 4′ x 4′ Recessed Unit to complement Sylvania's New Troffer Series

Now at your command—shallow recessed fixtures in 1′, 2′ and 4′ widths to fit all modern ceilings.

Sylvania's new Troffer Series represents completeness in every sense of the word. Three separate housing designs are available to fit quickly and easily into every type of ceiling construction. You get complete choice of shieldings in both one and two foot widths—and in four and eight foot lengths. Matching incandescent Accent Units allow for pattern lighting or the creation of special effects.

To complement this Troffer Series and to expand the design potential of recessed lighting systems, Sylvania now offers a versatile 4′ x 4′ shallow recessed fixture featuring the same clean, smart appearance and the up-to-date design advantages which permit simpler and faster installation. This attractive 4′ x 4′ unit places another distinctive and useful lighting tool in your hands.

The advanced features found in Sylvania's Troffer Series—shallowness, concealed hinges and latches, variety of housings and shieldings, snap-up hanger and many others—are typical of the inherent advantages built into each and every Sylvania fixture line.

Take a look at Sweet's Architectural File for a quick review of Sylvania's complete and modern line. Better yet—send for a complete fixture catalog today. Leaf through it and you'll soon discover the wide choice of fluorescent lighting equipment offered by Sylvania.

For complete information on Sylvania's Troffer Series and 4′ x 4′ units, write to:

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
Department 59-1
One 48th Street, Wheeling, West Virginia

GO MODERN WITH LIGHTING BY **SYLVANIA**

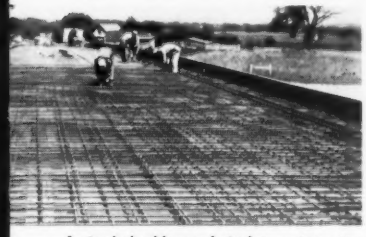
Fluorescent Lighting Fixtures and Systems

BEST FIXTURE VALUE IN EVERY PRICE RANGE

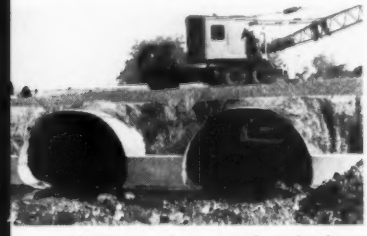
LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

800 bridges, underpasses and overpasses will stud the Interstate network in Ohio. Much of the 398,670 tons of steel used in these structures—beams and girders, plates, piling, bridge railings, etc.—will be furnished by United States Steel. USS *Tri-Ten* Steel and our other High Strength Steels, USS *Cor-Ten* and USS *Man-Ten*, as well as USS "T-1" Constructional Alloy Steel, are available for bridges in which weight saving is essential. USS AmBridge *I-Beam-Lok* Flooring, open or concrete filled, will keep weight and maintenance to a minimum.

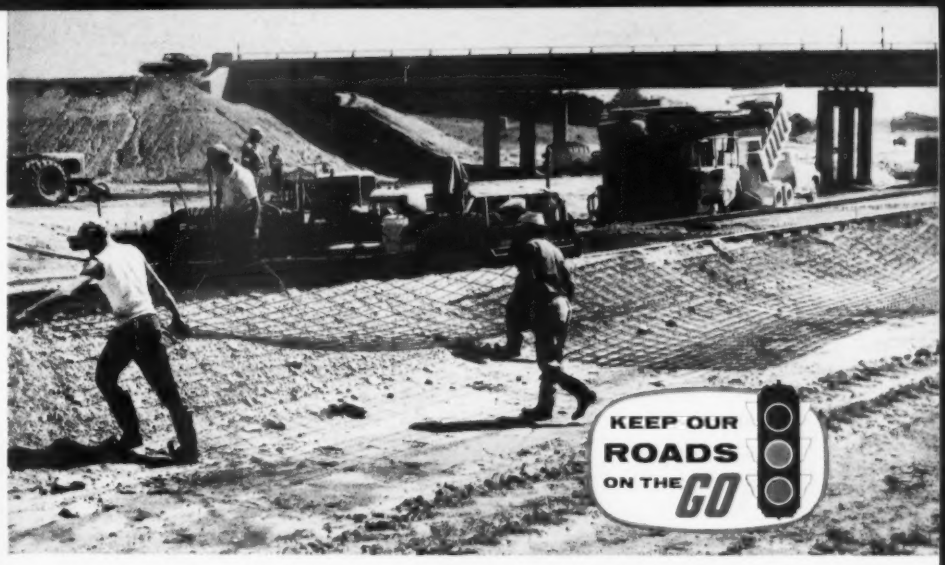
Steel expedites foundation work. For cofferdam construction, USS Steel Sheet Piling provides easy installation of strong earth- and watertight excavations. In piers and abutments, where high loading capacity and dependable protection against flood water and scour are needed, USS Steel H-Piles supply them. They offer a practical solution to many foundation problems, especially when unstable ground conditions are encountered.



A sturdy backbone of steel goes into the deck and piers of every Interstate bridge in Ohio, in the form of reinforcing bars. USS *Di-Lok* Bars feature a continuous diamond-shaped interlocking deformation assuring positive anchorage and reducing cracking to a minimum. And 1200 tons of steel welded wire fabric will make Ohio's roads stronger and longer lasting. USS *American* Welded Wire Fabric is made of cold-drawn steel wire to withstand high unit stresses.



26,825 tons of corrugated steel culverts will go into Ohio's expanding highways. For large drainage structures like these on Interstate 70, USS AmBridge Sectional Plate can be provided in Pipe, Pipe-Arch and Arch sections in a wide variety of sizes and gages. For smaller drainage systems, USS Galvanized Culvert Sheets ensure strength, low cost and speedy installation.



Ohio builds 1,524 miles of Interstate roads—

600,000 tons of steel help speed completion

No less than seven Interstate Highway routes will crisscross Ohio with a strategic network of high-speed freeways. Scheduled for completion by 1972, these modern expressways, linking all parts of the state, will give Ohio one of the safest, most easily traveled highway systems in the country and at the same time will put every factory, farm and business in Ohio only short hours distant from ocean-going shipping at Ohio's Lake Erie ports.

Work on this $2.3 billion system is progressing rapidly. Motorists are already using nearly 46 miles of the multilane freeways, and construction of 327 more miles was well underway by January 1, 1959. Ohio has put 97% of the highway funds allocated to date by the federal government to work in its record-breaking program.

Ohio's Interstate network comprises the following routes: IR 71—326 miles, Cincinnati to Conneaut; IR 75—213 miles, Cincinnati to Toledo; IR 70—230 miles, east-west Wheeling, W. Va., to Richmond, Ind.; IR 77—175 miles, Cleveland to Marietta; IR 90—250 miles, Toledo to Conneaut; IR 80—270 miles, Toledo to Youngstown; IR 271—60 miles, route locations being studied.

The program was developed under the direction of Charles M. Noble, Director of Highways, and George J. Thormyer, State Highway Engineer.

Get your free copy of our informative catalog. Write to United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS and trademarks in italics are registered by U. S. Steel

USS United States Steel

Divisions of United States Steel serving the highway market: American Bridge Division, Pittsburgh, Pa. • American Steel & Wire Division and Cyclone Fence Department, Cleveland, Ohio • Columbia-Geneva Steel Division, San Francisco, Calif. • Consolidated Western Steel Division, Los Angeles, Calif. • National Tube Division, Pittsburgh, Pa. • Tennessee Coal & Iron Division, Fairfield, Alabama • Universal Atlas Cement Division, New York • United States Steel Supply Division, Steel Service Centers, Chicago, Illinois

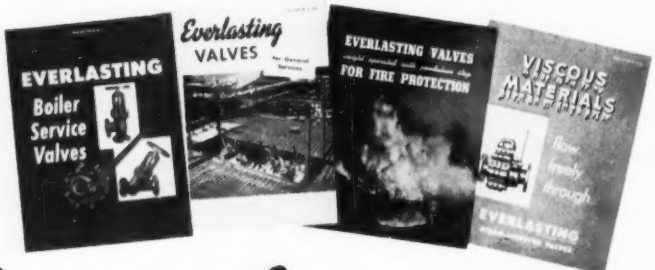
Less than
¼ turn
opens or closes

When you need...

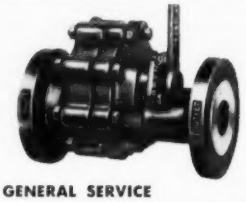
- Quick action
- Leak-Proof Seal
- Minimum Pressure Drop
- Straight-through full flow
- Valves that cannot wedge or jam
- Self-grinding rotating disc

Specify Everlasting Valves

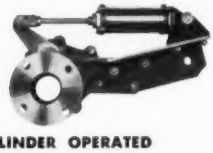
For more information **WRITE** for these bulletins.



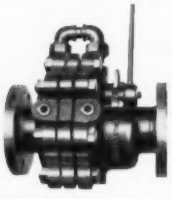
BOILER BLOW-OFF
Quick acting, also handwheel operated "Y" and angle types. For pressures up to 600 psi.



GENERAL SERVICE
Where drop-tight seal and full flow is essential.



CYLINDER OPERATED
Can be remotely controlled, electrically or manually.



STEAM JACKETED
Assures free flow of viscous materials.

WEIGHT-OPERATED
For automatic drains or emergency shut off.

Everlasting VALVES

EVERLASTING VALVE CO., 51 FISK STREET, JERSEY CITY 5, N. J.

EV 408

YOU never saw a metering pump

like this!

NEW streamlined safety shield. NEW crank-type design. NEW improved accuracy. NEW parts interchangeability. NEW operational efficiency. NEW maintenance ease . . .

all at a new lower price!

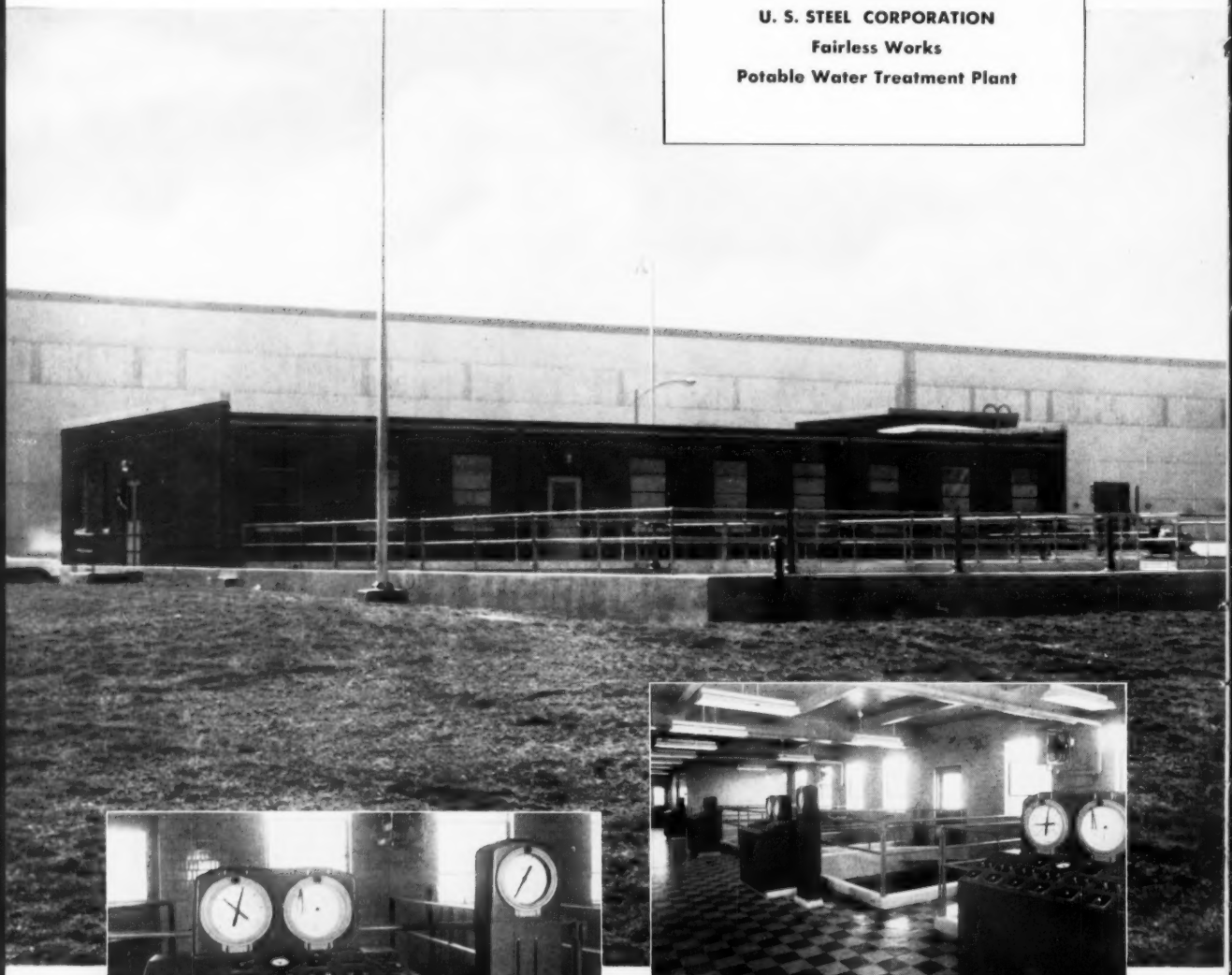
Meet Hills-McCanna Masterline . . . four metering pump models developed to bring increased economy and accuracy to metering and proportioning! Tested and proved capable of registering new highs in performance and dependability. Hills-McCanna Masterline pumps handle payloads from a fraction of a gallon to 1030 gph per feed . . . and are designed all new *inside* and *out* to do it better than ever. For new maintenance ease and the best pump investment, investigate Masterline pumps *now* for your chemical proportioning, water treatment, petroleum addition and other similar needs!

Write for informative new booklet! Just published, this new booklet gives all the details on Hills-McCanna Masterline Metering Pumps . . . pinpoints the features and elements that make Masterline pumps tops—for now and the future. Ask for Bulletin #900 "Look What's New in Metering Pumps." *Hills-McCanna Co.*, 4575 W. *Touhy Avenue, Chicago 46, Illinois.*

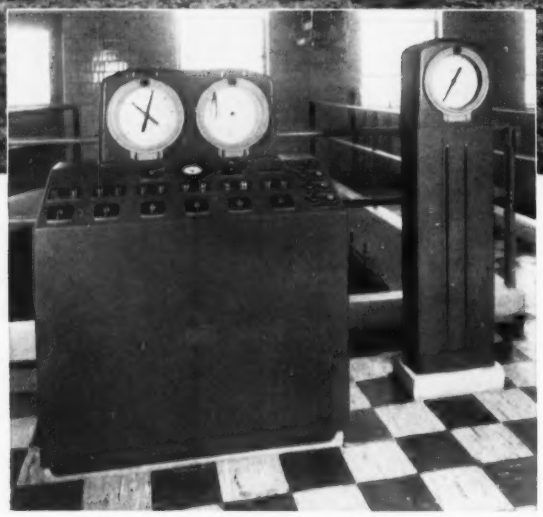
hills-mccanna company

THE PEOPLE WHO KNOW AND CONTROL FLOW

U. S. STEEL CORPORATION
Fairless Works
Potable Water Treatment Plant



Builders Auto-Central® Filter Control System features unusual reliability through automatic sequence operating of valves during the backwash cycle until the filter is restored to service. *The operator pushes the button — Auto-Central does the work!*



Manual control is available from individual filter consoles. These include instrumentation which displays information for monitoring filter operation. A separate gauge shows the extent of filter sand expansion while the filter is being backwashed.

ONE SOURCE
ONE RESPONSIBILITY

B-I-F

B-I-F INDUSTRIES

BUILDERS-PROVIDENCE • PROPORTIONEERS • OMEGA

POSITIVE CONTROL OF MATERIALS IN MOTION B·I·F

ONE SOURCE—ONE RESPONSIBILITY VITAL FACTOR IN EQUIPPING NEW INDUSTRIAL WATER TREATMENT PLANT!

Builders-Providence Controls and Equipment Installed at U. S. Steel's Fairless Works!

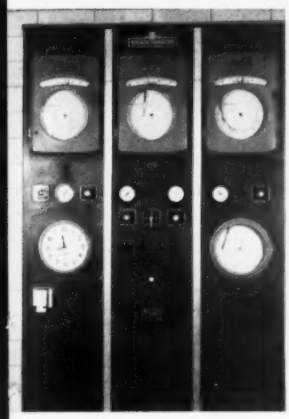
Cost-conscious industry realizes many distinct advantages in dealing with a single source. In water works plants, optimum operation depends upon the complete integration of many complex components. Builders-Providence, with the experience gained from thousands of performance-proven water works installations, provided U. S. Steel with such a source of controls and equipment.

The comprehensive Builders line is designed for ease of integration . . . resulting in faster installation, lower operating costs, greater systems reliability, and minimum maintenance.

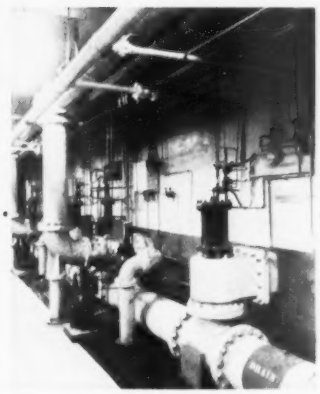
A single, responsible source for metering, control, valves, filter underdrains, wash water troughs, gas (liquid and dry) chemical feeders . . . backed by a nation-wide sales and service organization . . . saves time and money during the construction phase, the operating phase . . . and for years afterward!

For complete satisfaction, insist on the high performance standards which B-I-F maintains through its nation-wide sales and service organization. Write **B-I-F Industries, Inc., 512 Harris Avenue, Providence 1, R. I.**

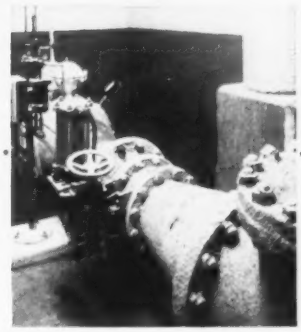
Cost of water treatment chemicals, alum and hydrated lime, is minimized with Omega Universal Feeders. The chemicals are applied in proportion to the flow of water, insuring correct dosage regardless of variations in plant output.



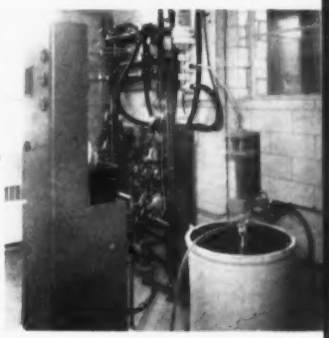
Builders Auto-Central Control Panel is equipped with manual and automatic controls . . . with audible alarms and lights to indicate any departure from desired conditions.



The special, angle-pattern, filter drain valve shown in foreground permits greater economy and simplicity of main piping. Building space is used efficiently. There is easy access for maintenance of equipment.



Flow of incoming water to be treated is metered and automatically held to a predetermined flow-rate through a Builders Automatic Venturi Flow Controller. The Builders rubber-lined Butterfly Valve is equipped for both automatic and manual emergency operation.



Builders automatic proportional Chlorinizer combined with Proportioneers Sodium Chlorite Feeder generates chlorine dioxide which is highly efficient in providing water free of taste, odors and harmful bacteria.

J. B. Converse

—Starts on front cover

profession is inarticulate. If we are going to be in a position to achieve our proper place in society, we must have a group that can handle public speaking. We need men who can discuss engineering in a brief, accurate, and interesting manner."

Converse, whose firm annually handles projects valued at approximately $10 to $15 million, has definite opinions. "What success we have," he says, "we owe to one thing – politics. We always avoided them." Yet a very large percentage of the Converse organization's projects are for municipal, county, state, or Federal agencies.

Highways and Bridges

After graduating from Rensselaer Polytechnic Institute, Converse got his first job doing field work for the Alabama Highway Department. To gain experience on the drafting board, he also worked for Converse (no relation) Bridge Co., of Chattanooga, Tennessee, for two years.

During World War I, he was in the Construction Division of Camp Sheridan. After the War he returned to the Alabama Highway Department. During his public career, Converse designed Alabama's first reinforced concrete bridge. The bridge, in the Tuskegee-Phenix City area, was constructed in 1917 and is still in use.

Converse moved to New Orleans in 1919 and was associated with the late J. W. Billingsley, Consulting Engineer, for eight years. Then, in 1927, he moved to Mobile to serve as County Highway Engineer in charge of the first paved highway and bridge bond issue of the County ($5 million). It was at this point in his career that he first ran into "politics" on a big scale. Rather than participate, he resigned his position.

Organizes Consulting Firm

It then was decided that the time had arrived to organize his own firm. But with no bread and butter accounts with which to start, the early days of his business were quite a struggle.

Soon, however, for no reason known to Converse, he received a telegram from Port Arthur, Texas, stating that he was being considered for a $4 million project of seawalls and pumping stations for that Gulf Coast community.

Next, a telegram arrived stating that Converse could forget the project because Port Arthur officials already had interviewed 14 engineers and they considered that enough. Converse answered this by immediately heading for his automobile. His wife then sent a telegram that he already was on his way to Port Arthur, and it was too late to stop him.

He got the job.

Since he did not even have acquaintances in Port Arthur, Converse was curious and asked who had suggested him. Since he never had heard of his benefactor, he then paid a call to find out "why me?" It turned out that the story of how Converse had resigned his position as County Highway Engineer rather than become involved in politics had been remembered. "The reason we contacted you is that we did not think you would get involved in the petty politics of this place," the young engineer was told.

So despite the stock market crash a short time later, Converse had a $4 million project to see him through the lean years of the early depression when older and more experienced consulting engineers were closing their offices for lack of work.

Serves Community and Profession

While avoiding politics, Converse has not evaded his civic or professional duties. A list of the positions he has held (or holds) looks like a directory. However, he also avoids campaigning. "I have never raised a finger to be elected to any office." Yet he won more votes for the Mobile County School Board than did the five campaigning candidates.

Of all his civic and professional offices, Converse gets the most pleasure from his membership on the Alabama State Board of Registration for Professional Engineers. He has been on the Board for 13 years. A member of the first Alabama licensing board, Converse holds registration certificate No. 5, which was issued in 1936.

A past president of the Alabama Section of the American Society of Civil Engineers, Converse also currently is vice-president of the Alabama Society of Professional Engineers. "I have a lot of confidence in the National Society of Professional Engineers. It starts from a sound base by requiring all members to be registered. Right now we are trying to form a Functional Section for consulting engineers," he added.

Regulation of Corporate Practice

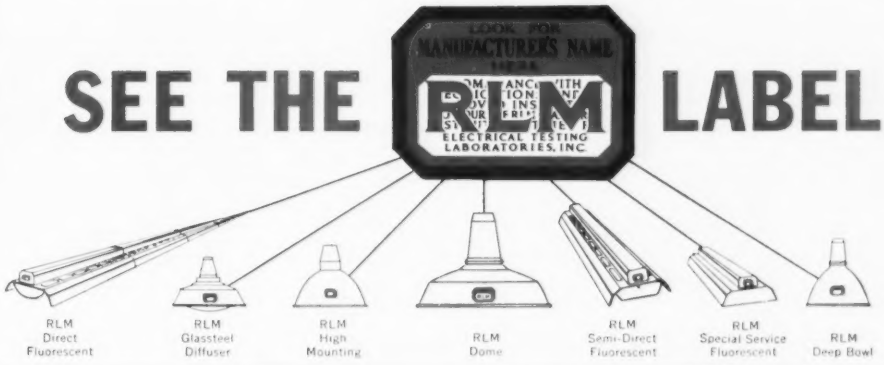
Converse always has had a desire to "do something for the profession." Currently he is helping to fight what he considers one of the most important battles of the engineering profession – unregulated corporate practice. Although his firm is incorporated, Converse thinks the practice of engineering through corporations must be regulated carefully. "If the profession does not properly regulate the corporate practice of engineering, the profession will be destroyed."

Converse pointed out that an engineering corporation could have a nonengineer as president

Either it is RLM APPROVED or it is NOT!

The ONLY WAY to be SURE is to

SEE THE RLM LABEL!



There is NO SUCH THING as an RLM "TYPE" Fixture

According to the new, higher I.E.S. Recommended Industrial Lighting Levels, 80% of present industrial lighting is now obsolete. This makes RLM quality concepts of lighting equipment design, performance and maintenance features more important than ever.

You can't have quality lighting without quality lighting equipment!

There are those who claim a lighting unit to be "just as good" as an RLM-labeled unit. It may even LOOK like an RLM unit. But the only proof positive is the RLM Label itself — the only evidence that the unit is RLM approved.

Why there is NO SUCH THING as an RLM "Type"?

The RLM Label on fluorescent and incandescent lighting units, first of all, assures the buyer of design and construction that meet the RLM Institute's high standards of quality. However, he also receives a Warranty of Uniform Quality because of the Inspection System back of every RLM-labeled unit. This Inspection System assures the buyer that each and every fixture labeled will uniformly meet the quality RLM standards.

How RLM Checks Uniformity of Quality

RLM testing and inspection procedures require that representatives of the Electrical Testing Laboratories periodically visit plants of all RLM Member-manufacturers. They take lighting fixtures right off the assembly lines and out of stock for testing and inspection at their laboratories. They may also obtain test samples directly from the distributors' shelves or out of contractors' stocks on the job in order to check Uniform Quality at every level of distribution.

This activity of the RLM Standards Institute, which makes possible the Warranty of Uniform Quality, is not duplicated by any other agency in the lighting industry. That is why there is no such thing as an RLM "Type" Lighting Unit.

Uniform Quality as assured by the RLM Label does not mean that all RLM fixtures made by the various manufacturers are alike in quality. Quite the contrary, each manufacturer engineers into his RLM-labeled fixtures such other advancements in design and quality which he deems important to quality performance. Uniform Quality refers to the labeled fixtures delivered to the buyer by the manufacturer.

Uniform Quality Essential to Finest Performance

This quality uniformity in delivered fixtures is essential to uniformly satisfactory lighting equipment performance. It assures that each unit in the system performs with equal efficiency to the other . . . that ballasts function with uniform efficiency . . . that the reflection factor be uniform from unit to unit . . . that the units be of uniformly durable construction with the identical-gauge steel and the same thickness Porcelain Enamel. Such uniformity reduces to a minimum the plague of spotty performance by individual units in a lighting system.

FREE SPECIFICATIONS BOOKLET! FREE I.E.S. Industrial Lighting Recommendations!

These two publications are a must to anyone planning lighting or re-lighting projects of industrial plants and utilitarian locations. Contains all RLM Specifications. For a complimentary copy write: RLM Standards Institute, Inc., 326 W. Madison St., Suite 8353, Chicago 6, Ill.

R-526

Every RLM Unit Must Conform with High-Quality Standards such as these:

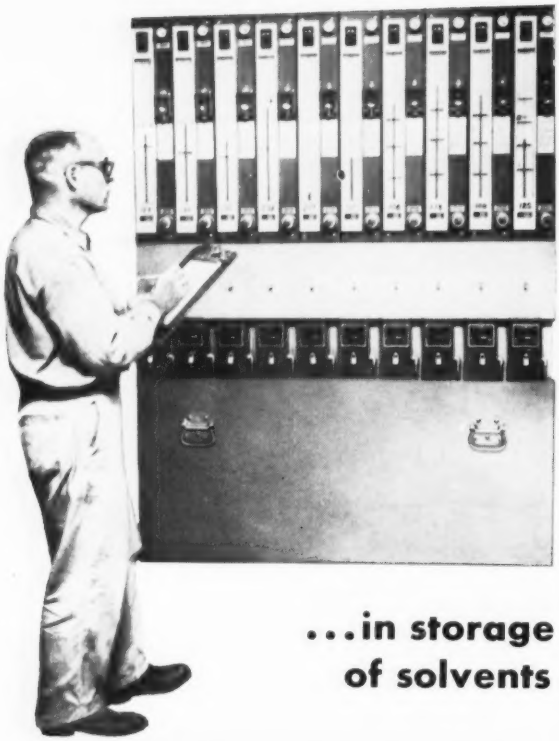
Porcelain Enamel Reflectors — all porcelain enamel RLM Units must have a specified thickness of Genuine Porcelain Enamel fused to steel. This unsurpassed high-reflection, high-diffusion reflecting surface is the only commercially available finish that cannot deteriorate or corrode. Simple soap-and-water cleaning quickly restores it to original efficiency.

High-Quality Ballasts — RLM Fluorescent Units must be equipped with Certified Ballasts which prevent high-temperature ballast operations, supply proper starting current, maintain proper operating watts to the lamp. Because of their high power factor, present wiring capacity can be utilized most efficiently.

Reflector Design — every RLM Unit must conform with the approved principles of Illuminating Engineering. Such design protects the workers' eyes while delivering, not only the most light per dollar, but also the required quality of light for the individual seeing task.

Sound Construction — RLM Units must comply with high fabrication and materials to insure standards of maximum resistance to sag, distortion and breakage.

RLM STANDARDS INSTITUTE



...in storage of solvents

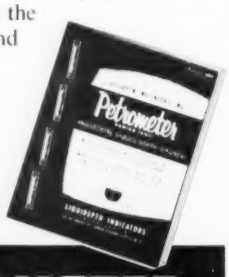
PETROMETER INDICATORS SOLVE INVENTORY & SAFETY PROBLEMS

Gotham Ink & Color Company, Long Island City, N. Y. found the answer to its solvent storage and handling problems in an underground tank system equipped with Petrometer remote reading Liquid Level Indicators and Petrometer Safety Cleanout Valves.

The solvents, toluol, ethyl acetate, petroleum spirits, etc. were formerly supplied in 55 gallon drums, which required expansive storage space and considerable handling. Today all solvents are stored underground. The Petrometer Indicator on each tank provides visual, up-to-the-minute record of tank contents. The Safety Cleanout Valve permits safe, vapor-tight access to the tank bottom for removal of water and sludge or for emptying the tank for a change of solvent.

The entire system has been approved by Underwriters Laboratory, Factory Mutual and the New York Board of Standards and Appeals.

For information on Petrometer Indicators and Control Systems, write for Bulletin 6004A.



Petrometer

PETROMETER

CORPORATION

43-22 TENTH ST. LONG ISLAND CITY 1, N. Y.

and a board of directors without engineers. With a situation like that, the corporation officials could indulge in highly unethical practices such as kickbacks, excessive political contributions, or even bribes, and the engineering boards would have no control over them or their activities.

Seeks a New Law

At the present time, Converse is working with a group planning to introduce legislation to require all officers and directors of any corporation practicing engineering for public agencies to be registered professional engineers. With this law in effect, any corporation official found guilty of unethical practices could be taken before the Board of Registration and have his license revoked.

"I am in favor of even further restrictions on corporations," Converse stated. "And I say this with the full realization that further revisions may step on some toes. In fact, mine may be among those that are bruised."

Currently Converse also is preparing a speech that will be delivered soon to be titled "Engineering – a Profession or Racket?" as an aid to his work for stricter regulation of corporations. For as he puts it, "If this [unregulated practice of engineering by corporations] continues, consulting engineers will have to form some association to protect their professional reputation."

Encourages Registration

The Converse firm also is equally concerned about protecting its own professional status. "If a man is in charge of engineering work for my firm, he is a registered engineer. I encourage the young men to become registered as soon as possible."

Converse also operates his own educational program in other ways. No member of the J. B. Converse organization can remember how many young boys the firm has helped to obtain a college education. Converse allows any ambitious young future engineer to work on a co-op plan. The youth works for a period, then goes to school for a period, rotating the two until he obtains a degree. The time arrangements are chosen by the student, and the plan has no strings attached.

Converse told of one competent young field man who did an excellent but limited job. One April Converse gave him a raise and told him that if he were not registered in college the opening day in September he would be fired effective that date. Today the man has a college degree.

Training Program

Young graduates who start with the Converse firm also can count on a training program lasting up to eight years. "We have turned out some top-notch

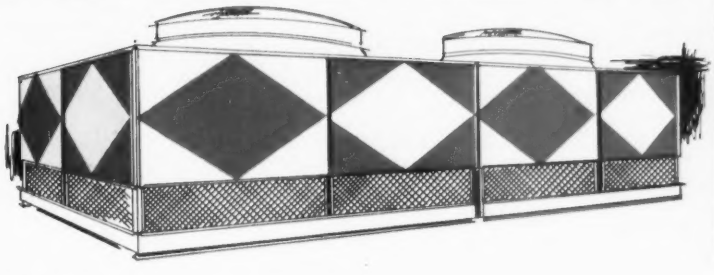
NEW IDEA !

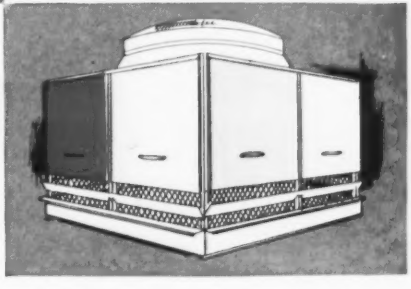
Decorative Cooling Towers . . .

Now, a cooling tower can be an attractive, functional part of a building instead of an object you'd like to hide . . . if it's a Panelramic tower by Pritchard. This new concept in cooling towers features colored panels that lend themselves to a wide variety of architectural treatment. Panels can be used to blend the tower with color scheme of the building, to serve as a distinctive company identification sign, or as a design element in the silhouette of the building. You save your client the cost of masonry enclosures and other expensive devices for camouflaging eyesores.

Panelramic Towers are available in a wide range of capacities and choice of panel materials. Plastic panels, for example, can be furnished with designs or colors permanently bonded in the material. Descriptive bulletin gives additional details and product data. Write for free copy.

J.F. Pritchard & Co.
OF CALIFORNIA
4625 Roanoke Parkway, Dept. 131
Kansas City 12, Missouri





QUESTION:

What *ONE* Type of Pipe Can Fill *ALL* Piping Requirements?

ANSWER:

***NONE*, of course. *NO ONE* Type of Pipe is *BEST* for *ALL* applications.**

SOUTHWESTERN PLASTIC PIPE COMPANY offers you a *full line* of quality-controlled plastic pipe that *will* meet many of your piping needs.

SOUTHWESTERN PLASTIC PIPE possesses certain characteristics which are of particular interest to engineers:

NON-AGING—no physical deterioration
HIGH IMPACT STRENGTH—withstands shock loads
NON-INFLAMMABLE—safe to install where fumes may be a hazard
RESISTS SCALE—and other build-up; maintains high-flow capacity
NON-TOXIC—will not impart taste or odor
NON-CORROSIVE—unaffected by chemicals, and cannot rust
NON-MAGNETIC—and immune to galvanic corrosion
FULL RANGE OF SIZES—¼" through 12" diameters

SOUTHWESTERN PLASTIC PIPE has been proven in these and many other applications:

- Conduit for electrical and communication lines
- Potable water lines
- Transmission of corrosive materials and wastes
- Brine circulation lines
- Natural gas lines
- Air conditioning tubing
- Sewage drain lines

With SOUTHWESTERN, you deal with a pioneer in the industry, backed by more than 50 years' experience in making pipe.

Write, wire or call for complete information

Southwestern
PLASTIC PIPE CO.
P. O. Box 117 • Mineral Wells, Texas Phone FA 5-3344

SWP-21

engineers. Of course, we have a tremendous investment in our young men, but we never have lost anyone we wanted to keep," Converse explained.

First, a new young engineer must have six months to one year of experience on the drafting board. Then he is assigned to the field until he has mastered such things as inspection and instrument work. This is followed by years spent in the office, working with experts in all fields (the Converse firm does civil, mechanical, and electrical engineering).

"We try not to let an engineer specialize until the end of eight years. In our firm, all job chiefs must be capable of going to the aid of the busiest man. We even had one electrical engineer who became so interested in the civil work that he continued his studies and also became a civil engineer."

Employees at J. B. Converse also follow the example of their board chairman and take an active part in civic affairs. Some of the engineers serve as volunteer substitute teachers at nearby schools.

Fringe Benefits

The Converse firm, with only 50 employees normally, also has fringe benefits equal to the best offered by many larger organizations. For some time, the company has provided medical and life insurance at no cost to the employee. This year, a pension plan was begun. ("Because of my age, I could not qualify for our pension plan," Converse commented.) Profits also are shared with the employees on a length of service and merit basis.

The name "Converse" has been familiar in the South for several generations. Ephraim K. Converse, grandfather of the consulting engineer, founded the New Orleans Board of Trade. Converse has followed somewhat in his footsteps. He has served as president of the Alabama State Chamber of Commerce for three terms and the Mobile Chamber of Commerce for two terms.

Long-Time Clients

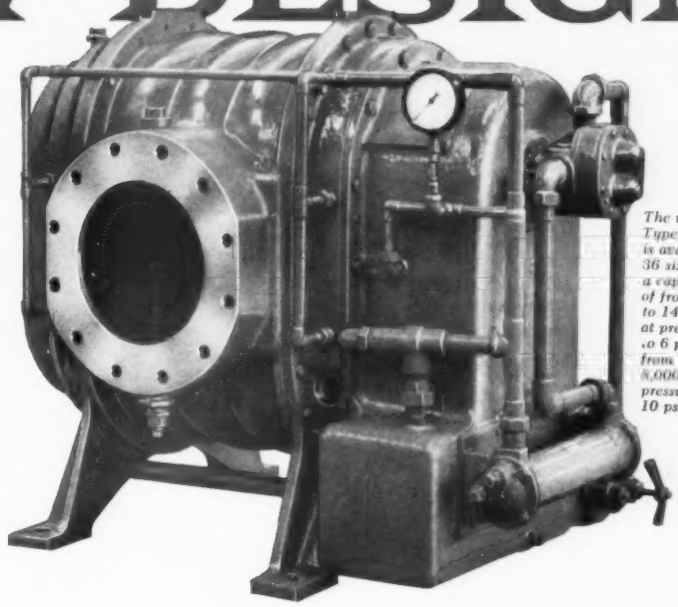
Today, some of the largest engineering projects in the South bear the "Converse" name. Since World War I, not much shipbuilding had been done in the deep South, but in 1936, Converse designed a $15 million shipyard including fitting-out docks, a mold loft, railroads, shop buildings, and utilities at Pascagoula, Mississippi, for the Ingalls Shipbuilding Corp.

When Converse began work, the site was merely an open field. The shipyard soon became the largest and most productive in the Gulf area. The firm also turned out the first welded ships produced in this section of the country.

The Ingalls Corp. still is a client, and Converse has been called back often for modernization plans. Today, Ingalls is equipped to build nuclear sub-

NEW-DESIGN

R-C blower delivers more CFM



The new R-C Type RAS Blower is available in 36 sizes covering a capacity range of from 2,000 to 14,000 cfm at pressures to 6 psig and from 1,500 to 8,000 cfm at pressures to 10 psig.

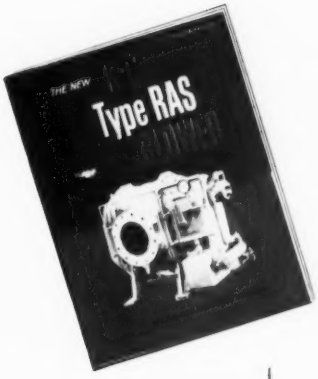
AT LOWER POWER COST

A new, high-performance R-C rotary positive blower (designated Type RAS) features two important design improvements. *First*, a new "segment waist" impeller contour that increases the volumetric efficiency of the blower. *Second*, a new vertical arrangement of the impellers that increases application flexibility.

The design of the "segment waist" impeller contour permits a higher pressure rating for a given impeller length. This in turn delivers greater displacement per revolution without increasing operating speed and at a lower power cost. And, in addition to being more quiet in operation, the design permits safe handling of entrained liquids.

The vertical arrangement of the impellers provides horizontal inlet and discharge connections for more convenient, simplified piping. Extremely compact, the blower also offers substantial savings in space requirements. And, as with all R-C rotary positive blowers, air delivered is free from oil vapors and other contaminants.

Roots-Connersville RAS blowers offer many advantages—exclusive rotary positive design, ease of installation, efficiency of operation, and long years of trouble-free service. These features are the result of R-C's specialized experience of more than 100 years in the design and application of air and gas handling equipment.



For additional data, please refer to pages 565-568 in **Chemical Engineering Catalog,** *our section in* **Mechanical Catalog,** *or write for* **Bulletin RAS-158.**

For gas service too...This same new design is also available in pumps for gas service. Designated Type RGS, the gas pumps differ from Type RAS Blowers only in that a mechanical face type seal is used instead of a lip seal.

ROOTS-CONNERSVILLE BLOWER
DIVISION OF DRESSER INDUSTRIES, INC.
359 Wilson Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

ONE OF THE DRESSER INDUSTRIES

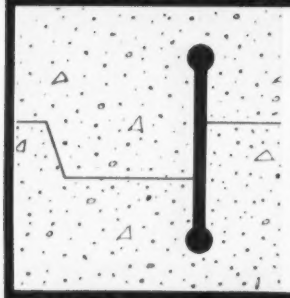
RUBBER and VINYL
SEALS
FOR MASONRY JOINTS

Water Seals for cast-in-place construction joints between concrete footings and walls, walls and floor slab, wall section and wall section, and floor slab and floor slab.

Sealing Gaskets for use between sill and coping stones, brick and stone wall panels, masonry wall panels and structural steel members.

Sealing strips for control joints in block constructed walls . . . watertight seals with an inherent, permanent liveliness for use in Michigan and Besser Control Joints.

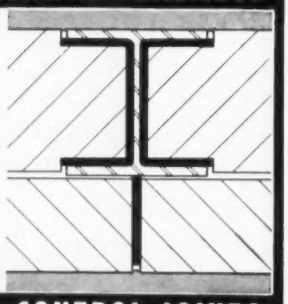
RUBBER or VINYL WATERSTOPS



Williams Waterstops are made from Natural Rubber Stock and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners, and will not crack or tear from shear action. Tensile Test: 3990 lbs., Elongation Test: 650%. Available in rolls up to 80 feet in length. Field splicing is simple. Williams Waterstops can also be furnished in Vinyl or Neoprene for industrial uses where resistance to oil and other injurious wastes is desirable.

EVERLASTIC MASONRY GASKETS

Everlastic Masonry Gaskets are a readily compressible, nonabsorbent Elastomer impervious to water and inert to heat, cold and acids. In masonry joints they permit linear expansion in summer heat, and seal joints against moisture which causes frost damage in winter. Everlastic Gaskets are furnished die-cut to specifications and coated with pressure sensitive adhesive . . . they should be used between sill and coping stones, brick or stone wall panels, and masonry and structural steel members.



WEATHERTITE for CONTROL JOINTS

Weathertite is a specially shaped, nonporous, expanded Polyvinyl Chloride strip which provides multiple, continuous contact surfaces when compressed, and thereby produces the positive pressure contact essential for an effective watertight seal in standard control joints in block constructed walls. Weathertite is available in two types to meet all requirements. Type "R" is made especially for use in Michigan Control Joints; Type "RB" is made especially for use in Besser Control Joints.

See Sweet's Files, or Write for Information.

WILLIAMS
EQUIPMENT and SUPPLY CO.
456 W. Eight Mile Rd., Hazel Park, Michigan

marines, big tankers, and some of the most modern passenger ships afloat.

The Anniston Ordnance Depot, near Bynum, Alabama, is another Converse project. This $20 million depot included the design of 900 ammunition igloos, 125 miles of highways, 30 miles of railroads, railroad shops and yards, sewage disposal system, and water supply system.

Another long-time client has been the Water Works Board of the City of Mobile. Since 1942, when initial work on the water supply, purification, and distribution system was begun, the firm has been in charge of design for all further expansion.

"According to the map," says Converse, "Mobile might appear to have no water supply problem, since the city is located on both a bay and a river. However, we are in the salt penetration zone, and we had to go 18 miles for our water source."

Converse Design Passes Test

The initial system for the city's complete industrial and domestic supply included a mile-long earthfill dam and a separate concrete spillway. After the project had been in operation only three years, it received an engineer's nightmare of a test. First, Mobile had the lowest rainfall in the 90-year history of local weather records. This was followed by a 20-in. rainfall in one day and the biggest flood the area has ever seen. The water supply system and dam survived in good condition.

Identified with the first major highway bond program in Alabama, Converse has continued to be prominent in the State's highway development. Currently his firm is working on a $10-million portion of the Beltline Highway (a section of Interstate Highway), which eventually will connect New Orleans and New York City.

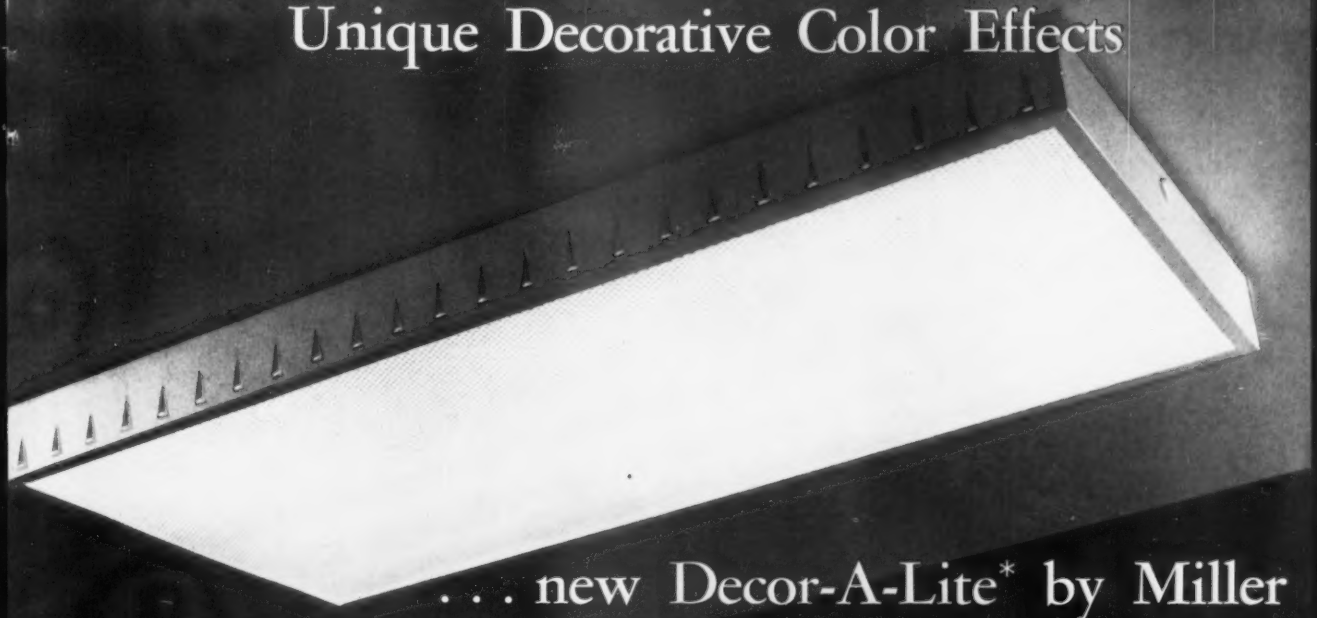
Another highway project Converse remembers with pride is a 140-ft swing girder bridge across Taylor Bayou near Port Arthur, Texas. This bridge, designed in 1931, was the first welded battle-deck bridge in the United States.

Enjoys Club Work

In looking backward over his numerous civic activities, Converse says none has given him more pleasure than his work in Rotary. The friendships formed there and the joint efforts made with the men in this organization for community good, have brought much satisfaction to him.

He has served as President of the Mobile Club and as District Governor for Rotary International. He believes that older engineers can render a splendid service to the young men in the profession by leading them into the many worthwhile civic affairs where their education and training can do so much for mankind. ▲▲

Unique Decorative Color Effects



. . . new Decor-A-Lite* by Miller

Here's a fluorescent fixture that gives lighting an exciting new role in interior design — yet *holds-the-ceiling* on installation and maintenance costs! Decor-A-Lite is a modular, surface type fixture with slim, contemporary lines. Easily installed, singly or in multiple patterns — it brings a customized, recessed effect to *on-the-ceiling* lighting for Stores, Offices, Schools, and Public Buildings.

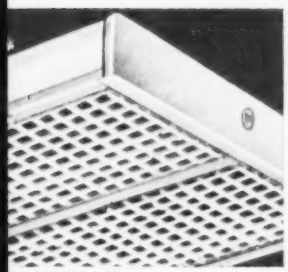
Unique, new decorative effects are easily attainable with Decor-A-Lite. Side panel lancings emit White or colored light (a choice of Peach, Green, or Gold) which can be changed as desired. And yet the color of the room lighting remains undistorted.

Decor-A-Lite comes in 1′ x 4′, 2′ x 2′, and 2′ x 4′ sizes. A choice of four bottom closures allows broad flexibility of lighting design and application.

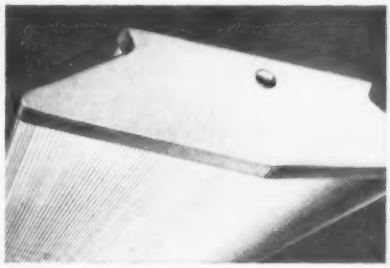
Discover today how Decor-A-Lite can meet your specific lighting design and installation needs. Write Dept. 359, The Miller Company, Meriden, Conn. for full catalog information.

*trade...ark

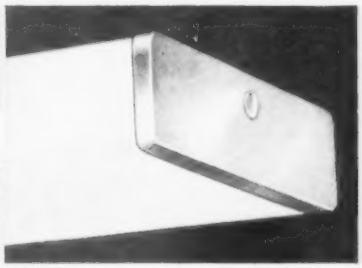
***Decor-A-Lite** is the newest addition to this* **popular priced** *line of fluorescent fixtures for Commercial use.*



MERCHANT



SABRE



SUBURBAN

LIGHTING BY

miller

SINCE 1844

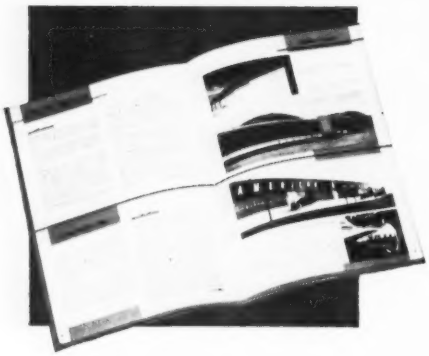
cyc-li

Contact Your Miller Representative for a Demonstration

Architect—Giffels and Rossetti
General Contractor—A. J. Etkin Co.

OVER 14,000 SQ. FEET OF DOOR OPENING

At Detroit's New Metropolitan Airport



THIS NEW CATALOG

. . . provides you with up-to-the-minute information on the many types of doors which can be furnished by Byrne.

Write for your copy—today.

At Detroit's new "jet age" airport is this thoroughly modern American Airlines hangar. It is significant that, as in most of the finest hangars being built today, Byrne doors are a most important feature of the building.

This installation provides an opening size 391 feet wide by 36 feet high. It consists of six 65-foot wide door leaves each with its own separate motor and drive.

Byrne engineers have had over 30 years' experience in the development of doors of all kinds, and particularly in the design and construction of hangar doors. Their abilities can be put to work for you . . . at any time.

BYRNE doors, inc.

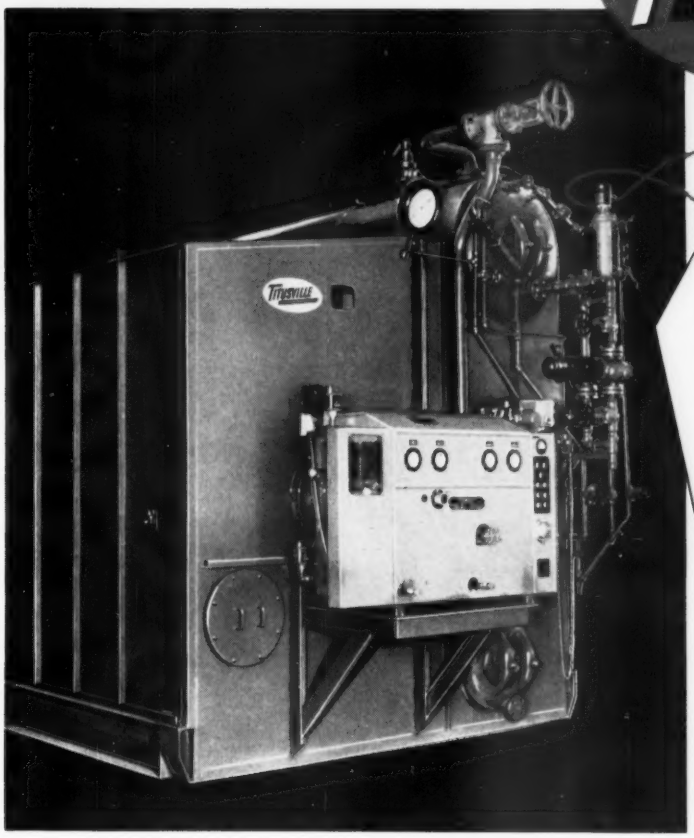
1603 E. Nine Mile Road, Ferndale, Detroit 20, Michigan

101 Park Ave., New York 17, N.Y. • Cafritz Bldg., Washington, D.C.
Byrne Doors, Ltd., 381 College St., Toronto 2B, Ont.

MEMBER OF THE HANGAR AND INDUSTRIAL DOOR TECHNICAL COUNCIL

quality-built by TITUSVILLE

BOILERS SINCE 1860



PACKAGED FOR YOUR BOILER ROOM

the Titusville type WTP

packaged steam generator

A completely factory-assembled, fully-equipped steam generator, the popular Titusville Type WTP is easily transported by rail or truck—ready for operation as soon as connected to fuel, steam and utility services. Compact in size, of TITUSVILLE quality in every detail, this advanced unit is supplied in capacities from 10,000 to 60,000 lbs of steam per hour. *Let us quote on your needs.*

Complete Details in Bulletin No. B-3255

—Write for your free copy!

THE TITUSVILLE IRON WORKS CO.

A Division of

Struthers Wells

TITUSVILLE, PENNSYLVANIA

Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

Plants at Titusville, Pa. and Warren, Pa.

Offices in Principal Cities

BOILER DIVISION

BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

PROCESSING EQUIPMENT DIVISION

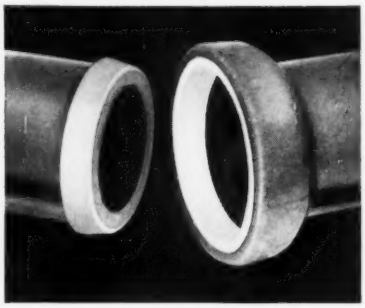
Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

FORGE DIVISION

Crankshafts . . . Pressure Vessels . . . Hydraulic Cylinders . . . Shafting . . . Straightening and Back-up Rolls

longer, stronger AMVIT Jointed Clay Pipe prevents infiltration SIX WAYS

Bottletight, Factory-Made Joint of Plasticized Resins of Polyvinyl-chloride gives lower cost-in-place



Engineering standard and specifications for sanitary sewers are written so that both the contractor and the community can obtain the best type of construction.

They limit the amount of infiltration in sewer pipe joints, which, in turn, reduces pumping and treatment plant costs. Amvit* Jointed Clay Pipe was especially designed to achieve best possible results.

1. FACTORY-MADE QUALITY

The Amvit Joint is manufactured from plasticized resins of polyvinyl-chloride. No other combination of materials is used or needed. It is applied on the pipe by a special manufacturing process and delivered to the job site ready for immediate installation.

2. DESIGN PREVENTS LEAKS

The Amvit Joint is a compression type joint based on the ball and socket principle. The material on the spigot end is a convex shape, with the bell end in a concave shape. Simply pushing the pipe together "makes" the joint, keeping the surfaces of the bell and spigot rings in constant compression. Thus, infiltration, exfiltration, and root penetration are prevented.

3. QUICK, FOUL-PROOF INSTALLATION

The joint is on the pipe delivered to the job site ready for immediate installations. No other materials such as caulking, joint compound, hot pots, or ladles are needed to make the Amvit Joint.

4. PERMITS DEFLECTION, ABSORBS SHOCKS

Amvit is made from a plastic which has many characteristics similar to rubber. It is pliable, permitting deflection without leakage. It is resilient, can absorb shocks, and vibration.

5. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing action. Because the joint is really tight, no foreign matter such as dirt, sand, or stones can possibly enter the line.

6. COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house to treatment plant.

Amvit Jointed Clay Pipe, in sizes 4" through 24", together with all fittings is available for immediate delivery in the Northeast and Central States.

*T. M. Registered

For more information on how Amvit can help cut your sewer installation costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you, for this descriptive folder.

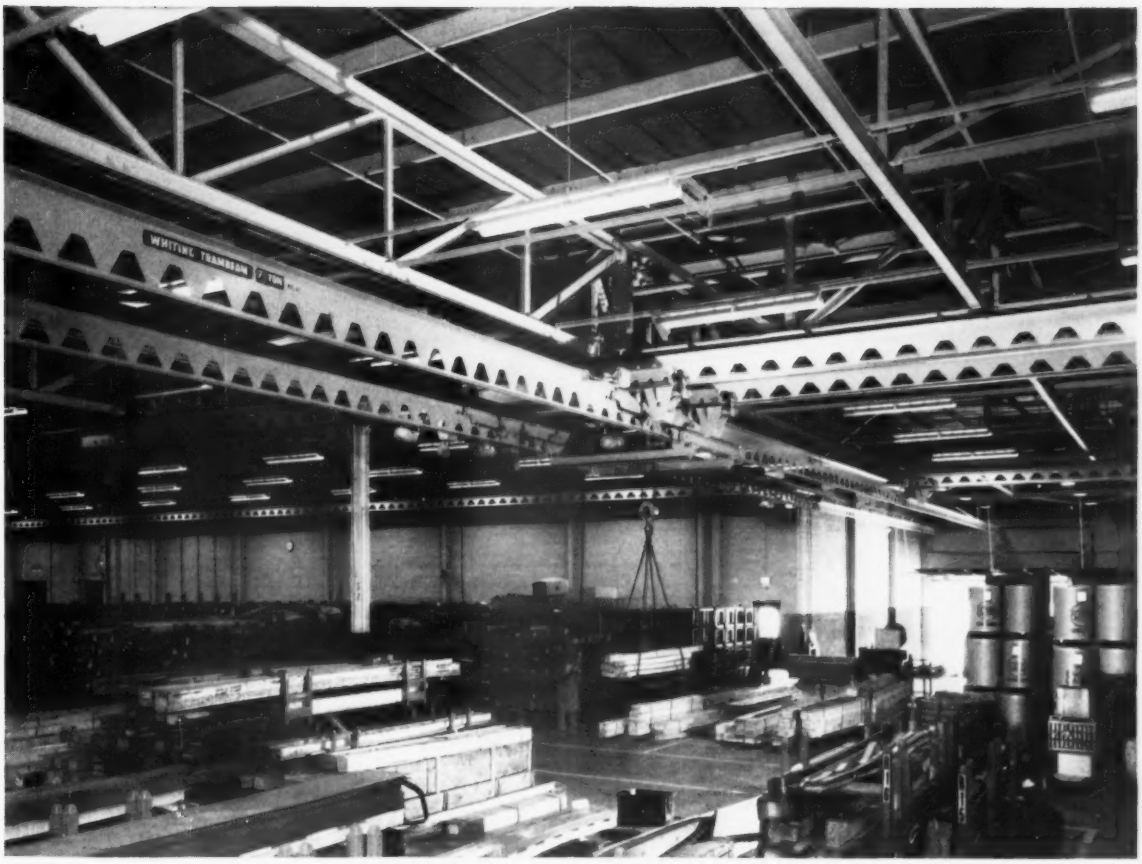
SINCE 1848

AMERICAN

American Vitrified Products Company

CLEVELAND, OHIO

PLANTS ACROSS THE NATION . . . Brazil, Indiana · Chicago, Illinois · Cleveland, Ohio · Crawfordsville, Indiana · Detroit, Michigan · East Liverpool, Ohio Fenton, Michigan · Grand Ledge, Michigan · Lisbon, Ohio · Los Angeles, California · Milwaukee, Wisconsin · South Bend, Indiana · St. Louis, Missouri · Whitehall, Illinois



How overhead handling saves space

Automatic Electric, winner of an award for one of 1957's best ten new plants, uses Whiting Trambeam Overhead Materials Handling Systems. A Trambeam Crane System moves finished products from packaging and crating area to temporary storage in the shipping room. Result: aisle space is minimized – total cubic space is more effectively utilized.

In the receiving and storage areas four 7½-ton Trambeam cranes run on 660-foot runways to move as much as five million pounds of raw materials per month to communications equipment production lines, efficiently and economically. Additional Trambeam Systems help the plating and other departments to maintain high-gear production. Find out how *your* plant can boost production, cut operating costs, and make full use of floor and overhead space with a Trambeam Overhead Materials Handling System. Get the facts today.

SEND FOR "METALWORKING PROFILES"

the big, colorful new booklet showing performance reports of Whiting products on the job . . . bringing new efficiency and economy to materials handling operations. Ask for booklet 242. *Whiting Corporation, 15620 Lathrop Avenue, Harvey, Illinois.*

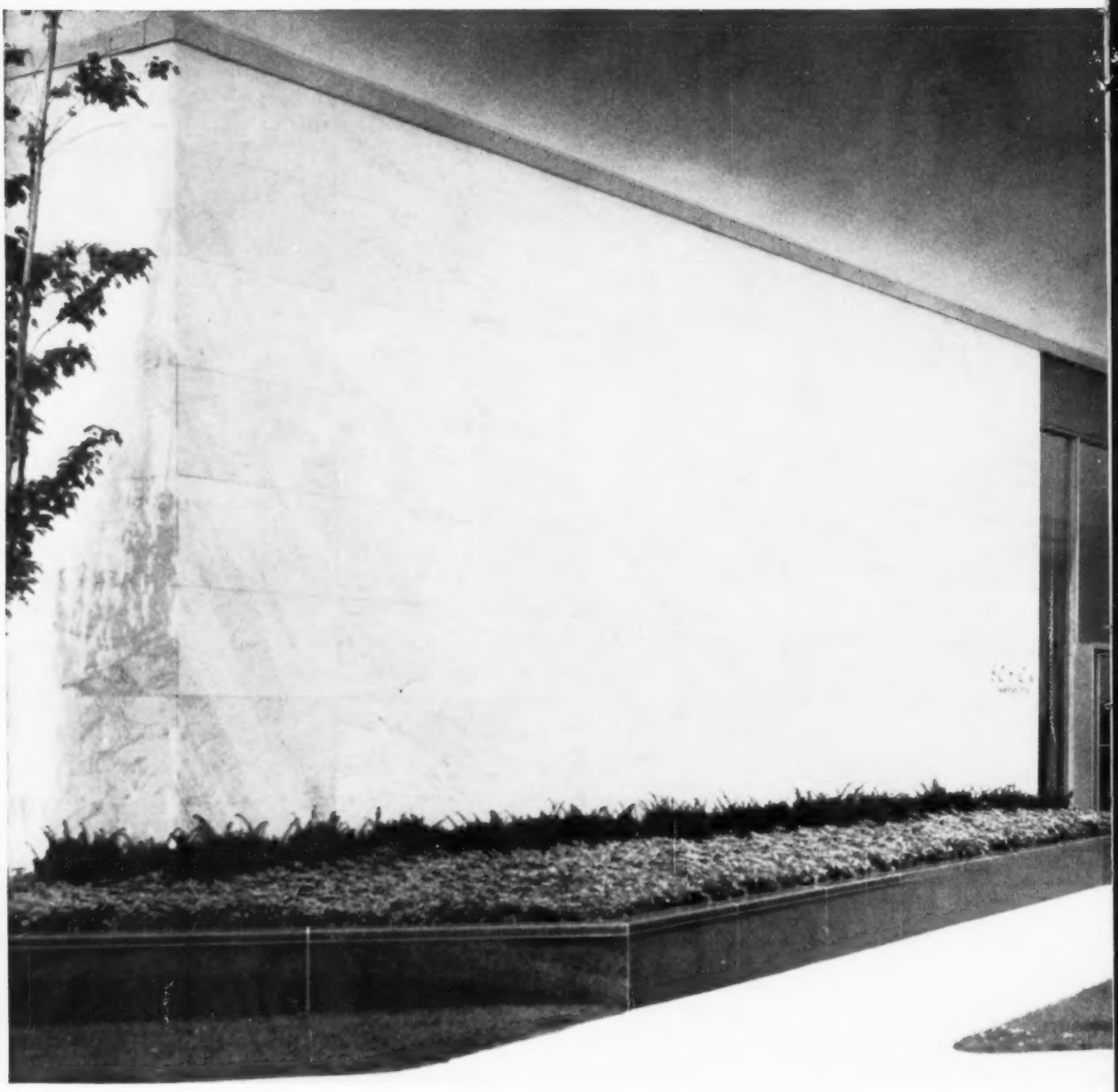
87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS

75 th year

WHITING

TRAMBEAM

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD, AND CHEMICAL PROCESSING EQUIPMENT



"We get all-year humidity control at low cost...thanks to GAS-operated CARRIER absorption refrigeration"

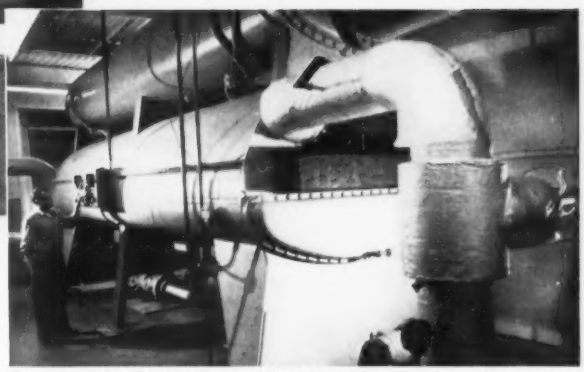
Thomas M. Garry, Schick Incorporated

VICE-PRESIDENT OF MANUFACTURING

"We needed refrigeration equipment which would give exact humidity control all year 'round to minimize rusting of the highly-polished parts used in making shaving heads. Our 595 ton gas-operated Carrier Absorption Refrigeration unit does the job with top efficiency... and provides comfort cooling for the entire plant at low operating costs."

The Carrier Absorption unit uses ordinary tap water as a refrigerant. No prime mover is required, only low pressure steam or hot water. Seasonally idle boilers can be put to use all

Pioneer producer of electric shavers, Schick Incorporated, occupies this modern, efficient, and completely air-conditioned building in Lancaster—heart of the Pennsylvania Dutch country.



Gas-operated Carrier Automatic Absorption Refrigeration

- cuts operating expenses
- minimum maintenance required
- low installation cost
- adjusts automatically to cooling load
- compact and light weight

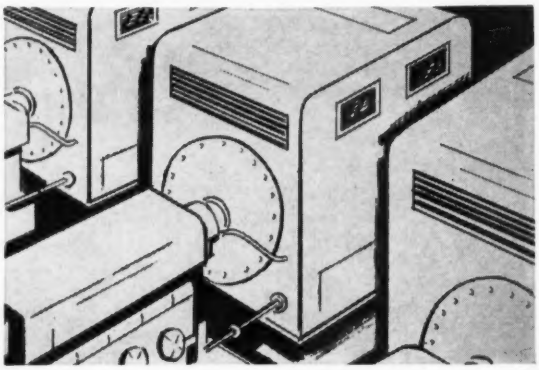
year around... and with gas as the boiler fuel, operating costs are cut to a minimum. Low maintenance is another substantial savings, since there are no major moving parts to get out of order, need replacing or repair.

Because of low installation, operating and maintenance costs, the gas-operated Carrier Automatic Absorption units can be the source of important savings. For full details, call your local gas company, or write to the Carrier Corporation, Syracuse, New York. *American Gas Association.*

Here's why you save by specifying Silicone Insulated Drive Motors

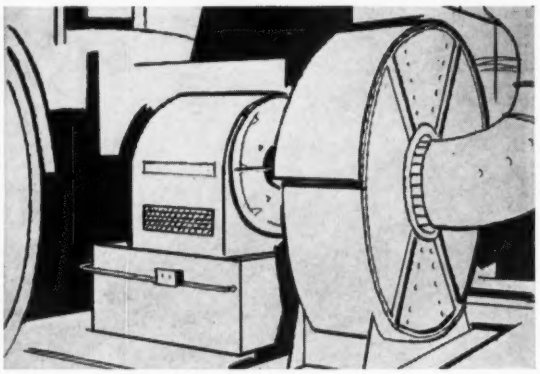
They're More Reliable

Utility engineers report that auxiliary drive motors carry 30% to 50% overloads without strain when they're designed to use the extra thermal stability of Dow Corning Silicones to increase service factor. That's greater assurance of service continuity than possible with any other insulation! This same thermal stability means top reliability in high ambient areas. Silicone insulated motors keep going despite overloads and ambients that cause other motors to fail.



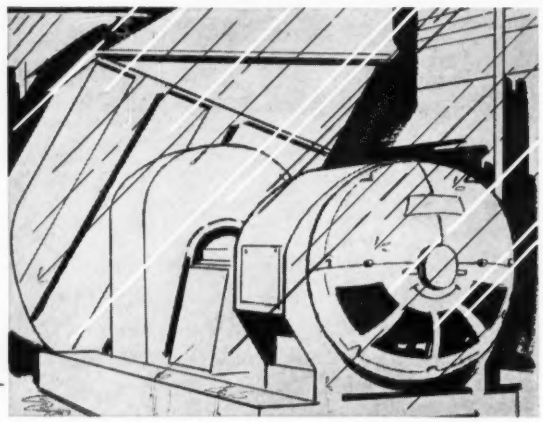
Smaller Motors Do The Job

By specifying motors with horsepower ratings matched to normal loads and letting the increased service factors provided by silicones carry the overloads, many companies now pay less for auxiliary drive motors. Following this practice, savings are realized not only in initial equipment costs . . . but in operating costs as well. Part-load inefficiencies and poor power factor resulting from overmotoring are eliminated. And, because silicone insulated motors pack more horsepower per frame size, mountings are smaller, less costly . . . installation problems minimized.



Simplified Enclosures Cost Less

Silicone insulated motors cost substantially less than other motors built for outdoor service. The reason: much lower enclosure costs because of "self-protecting" insulation systems made with Silastic, the Dow Corning silicone rubber. Specify open frames! There's no need for a premium priced enclosure to protect the insulation. Silicone rubber insulated open motors withstand torrential rains, hurricane winds, corrosive fumes, dust, snow, sleet, cold, heat . . . even flooding.



Send today for free brochure detailing how you can save with silicone insulated motors. Includes up-to-date list of manufacturers offering equipment insulated with Dow Corning Silicones.

Address Dept. 1015.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

FLOWAY

formerly SMITHway

Helping the Jets Fly!

In Arctic cold or tropical heat FloWay delivers the split-second performance the jets demand.

RUGGED!

IMPELLERS . . .
Closed or semi-open impellers available — for volatile or hydrocarbon fluids. Composition altered to suit the specific condition.

LINESHAFTS . . .
Product-lubricated construction, utilizing high grade stainless steel for bearings, shafts, and couplings.

SHAFT SEALS . . .
Product lubricated construction. Fitted with conventional stuffing box or mechanical type seals. Seals are available to accomodate pressures from 0 to 500 PSI and temperatures from —55°F to 250°F.

PUMP SUCTION DESIGNS
For wet or dry pit installations. Now available are new low-suction bells for shallow submergence — no vortexing and minimum sump surging. For dry-pit operations, threaded or flanged suction connections may be used with variety of strainers.

Rugged dependability under a variety of the most exacting conditions . . that's one reason the U.S. Air Force chooses FloWay jet fuel pumps.

Industry, too, has pumping requirements that demand total dependability. You'll find it in FloWay's complete range of industrial pumps — from 15 GPM to 4,000 GPM. Experienced designing, precision manufacturing and rigid inspection are your assurance of peak efficiency and uniform capacity over long periods of heavy use. FloWays are equipped with standard cast iron or fabricated steel heads.

Local sources throughout the world carry replacement parts. Inquire about your specific FloWay today.

MANUFACTURED BY

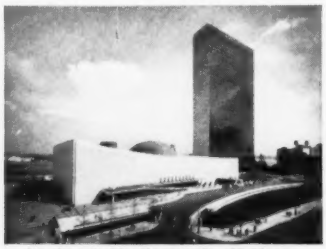
FIESE & FIRSTENBERGER MFG., INC.
2494 S. Railroad Ave. Fresno, California

FIESE & FIRSTENBERGER PUMPS FRESNO, CALIF.

When you need facts about signaling systems

—your "ready reference" is your Edwards field engineer. In the specialized field of signaling and protection systems, the Edwards man is just about as basic as your slide rule. He has the full information, the new ideas, the recent applications. His specialty is the complete range of signaling installations (and his delight is the unusual problem), because his company makes by far the most complete line of signaling systems and components. Your Edwards field engineer calls on wide-ranging experience, too—some of it shown here.

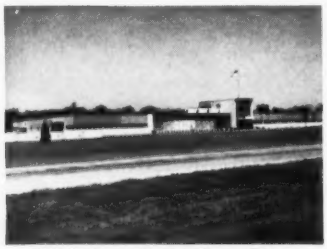
Grady Memorial Hospital, Atlanta, Georgia – Edwards nurses' call system for the 1100 beds; sectionalized automatic reset clock system; doctors' in-and-out registers; pharmacy intruder alarm; operating room timers.



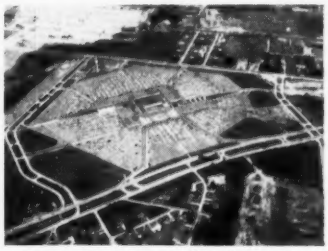
United Nations building, New York – Complete centrally supervised security system: fire alarm, smoke detection, and watchmen's call-in systems with central control.

Hillsdale High School, San Mateo, California—Edwards central control clock and program system adapted to the unique movable partitions; coded fire alarm system.

Texas Technological College, Lubbock, Texas – Edwards return call system with wire-saving exclusive simplified circuit, serving 732 dormitory rooms.



Miniature Precision Bearings, Inc., plant in Keene, New Hampshire – Edwards clock and program system; city-connected low-voltage fire alarm system, with automatic detectors, providing 24-hour protection.



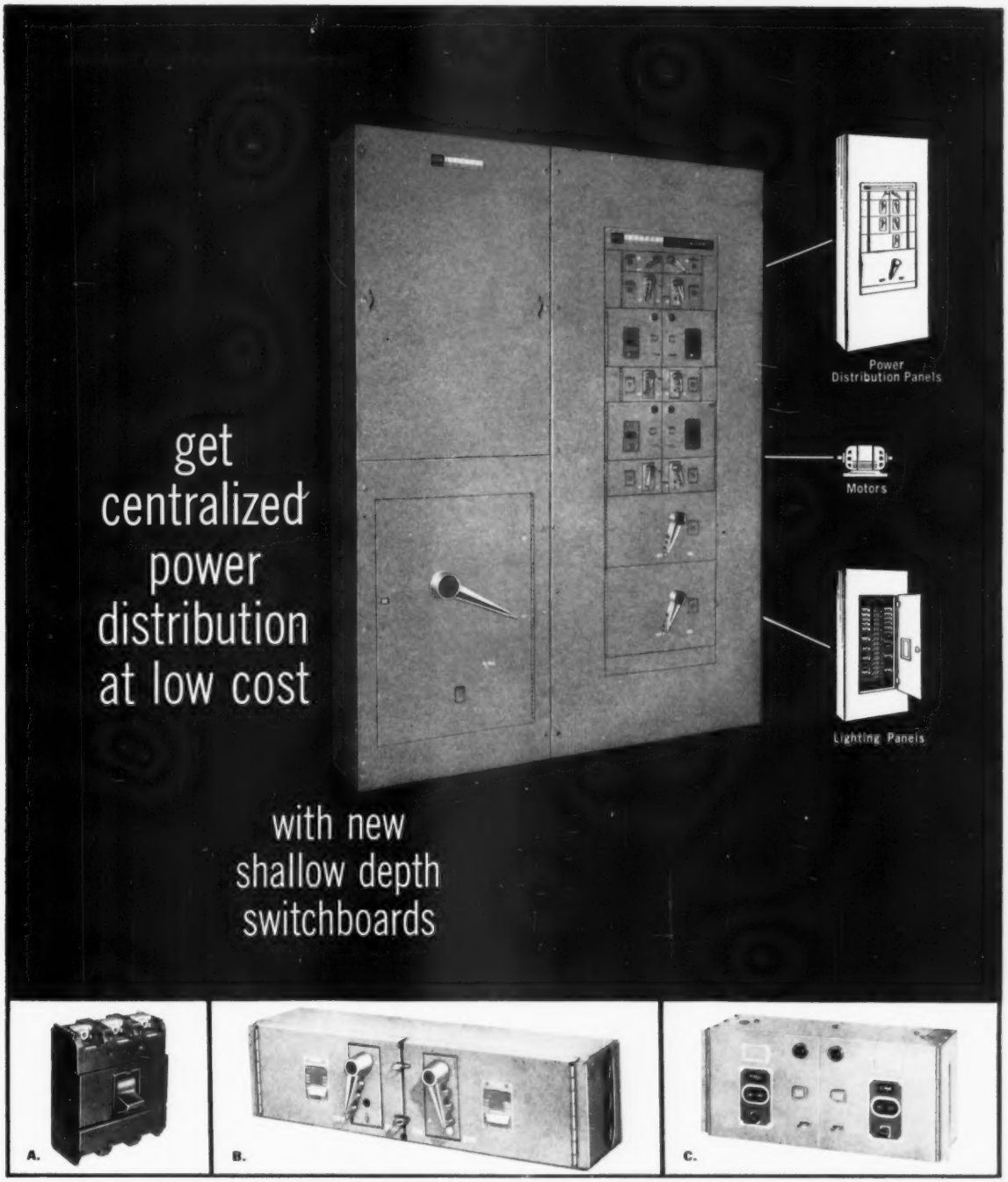
Northland Shopping Center, Detroit, Michigan – Edwards silent visual-paging system installed at The J. L. Hudson Co. store.

EDWARDS

Specialists in signaling since 1872

Design • Development • Manufacture

If you'd like the name of the nearest Edwards field engineer, or technical literature on any of our products, please write Dept. CO-3, Edwards Company, Inc., Norwalk, Conn. (In Canada: Edwards of Canada, Ltd, Owen Sound, Ont.)



get centralized power distribution at low cost

with new shallow depth switchboards

Here is versatility you never dreamed possible in switchboard design. Only 14 inches deep and rigidly constructed of prepunched, formed 11 gauge steel channels... these switchboards take a variety of interchangeable control and distribution units of modular dimension, giving a new degree of flexibility and centralization of power distribution equipment. Advantages: consolidates all of your motor starters, fusible switches, and circuit breakers into a professional looking installation with less floor space, lower installation and maintenance costs and greater flexibility in meeting future requirements. For complete details write today for Bulletin #3-310, Federal Pacific Electric Co., General Offices: Dept. 310, Newark 1, N. J.

A. TYPE AB CIRCUIT BREAKERS from 15 through 800 amps. Compact... positive protection... quick-make, quick-break operation... thermal-magnetic trip.

B. QMQB FUSIBLE SWITCH UNITS from 30 through 1200 amps. Heavy duty construction... quick-make, quick-break operation... visible blades... front operation.

C. MAGNETIC OR MANUAL MOTOR STARTERS in NEMA sizes 0 through 5. Pushbuttons, pilot lights, and accessories may be added as required.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment.

MEET THE MAN

. . . who's dedicated to **your** job
. . . who knows your needs
. . . who knows your problems
. . . who knows wire and cable
. . . who is backed by engineering specialists
. . . who is backed by a reliable manufacturer

YOUR ROME CABLE SALESMAN

Readers' Comment

Clarification . . . Needed

Sir:

Thank you for your kindness in sending the tear sheets of the article "Dealing with the Architect Client" from the July 1958 issue of CONSULTING ENGINEER. The reason for this request was that we had a number of letters from our members about the paragraph on page 124 immediately following the subheading "A Fair Fee Split." At first reading we too were concerned about the conclusion of your Committee of One-Hundred that ". . . a fair division of the total fee would be 20 to 25 percent to the architects (for a finder fee, negotiation, dealing with the client, blueprints, and coordination) and 75-80 percent to the consultants. A standard fee division, perhaps spelled out in the architect's contract with the client, would allow the architect to select the consultant by merit instead of price."

On second reading and further study we came to the conclusion that this was meant to apply only to that part of the project which the engineers designed, although this paragraph does not clearly state that this is the case. If it is the case, it would seem to be a fair division of fee for this part of the work.

Those members of AIA who objected to this paragraph obviously were under the impression that this division of fee between the architect and his consulting engineer would apply to the cost of the entire construction project.

We would like to know if our assumption is correct.

Charles H. Topping, ASCE
Roy F. Larson, FAIA
Co-Chairmen
AIA-EJC Joint Committee

. . . Supplied

A statement of clarification was sent to Messrs. Larson and Topping that reads as follows:

"In an article "Dealing With the Architect Client" which appeared in the July 1958 issue of CONSULTING ENGINEER, the following statement was made: "The members of the Committee [of One-Hundred] feel that a fair division of the total fee would be 20 to 25 percent to the architect (for a finder fee, negotiation, dealing with the client, blueprints, and coordination) and 75 to 80 percent to the consultants." It seems that some architects have been confused by this statement, and it should be made clear that the 75-80 percent to the consultants applies only to that portion of the work on which the consultant is directly engaged. For example, the Committee felt that the electrical or the mechanical engineer should get 75 to 80 percent of the fee based on the mechanical or the electrical portion of the project."

. . . Appreciated

Sir:

Thank you for your clarification of the article "Dealing With the Architect Client." It clears up the matter

MEET THE MAN

who's dedicated to **your** job

YOUR ROME CABLE SALESMAN:

Atlanta, Ga. (MU 8-9860) C. J. Murry, W. J. McCann; (PL 8-1794) F. D. Rucker

Baltimore, Md. L. D. Kernan

Birmingham, Ala. (TR 1-8955) R. H. Sawyer

Boston, Mass. (HA 6-7272) A. D. Stein, T. S. Gildersleeve, R. T. Gildersleeve, Byron Brewer

Buffalo, N. Y. (AM 3198) E. B. Jones

Charlotte, N. C. (EM 6-0864) W. W. Rambo

Chicago, Ill. (SP 2-2700) Stewart Johnston, T. C. Spriggs, J. A. May, D. B. Duffy

Cincinnati, O. (LI 2-0290) E. M. Groves

Cleveland, O. (SU 1-1240) J. F. Guyer

Dallas, Tex. (RI 7-4801) F. J. Peabody, J. L. Pearce, B. G. McDaniel

Denver, Colo. (KE 4-0533) E. T. Vonier, J. Vivian, K. Hall

Detroit, Mich. (TR 2-7578) A. K. Buckenmaier, B. F. Thomas

Houston, Tex. (FA 3-8385) G. A. Peabody, R. O. Witt, J. Jackson

Huntington, W. Va. (JA 3-5414) Thomas Orlovsky, Jr.

Indianapolis, Ind. (VI 6-2524) J. S. Scheppach

Jacksonville, Fla. (EV 7-5915) C. R. Stegin

Kansas City, Mo. (JE 1-4146) R. R. Davis

Lansing, Mich. (IV 4-0778) A. J. Dawson

Los Angeles, Calif. (RA 3-3631) H. S. Warren, O. O. Stedman, R. D. Golly, E. G. Gilmore, Jr., F. K. Duerst

Louisville, Ky. (TW 3-7512) Robert L. Jaffre

Milwaukee, Wisc. (BR 1-1101) T. E. McCarthy

Nashville, Tenn. (VE 2-0862) E. C. West

New Orleans, La. (VE 5-9210) W. Fulton

New York, N. Y. (MU 2-6590) E. T. Buckenmaier, W. S. Williams, W. R. Copp

Philadelphia, Pa. (MA 7-2070) W. A. Miller, G. E. Rolston, Jr.

Phoenix, Ariz. (AL 8-5281) Dick Barnes

Pittsburgh, Pa. (AT 1-0816) R. T. Edwards, Jr., J. W. Brunner, R. A. Gray

Portland, Ore. (CA 2-5470) Charles K. Shanks

Richmond, Va. (CO 6-3503) D. C. McMahon

St. Louis, Mo. (VO 3-4944) D. A. Thomas, J. W. Campbell, Jr.

St. Paul, Minn. (MI 6-7201) T. H. Stokke, W. Kufus

Salt Lake City, Utah (EL 9-8811) H. Lee Rawlings

San Francisco, Calif. (VA 6-3580) C. H. Kaufman, G. F. Black, G. H. Remelman, D. S. Smith

Seattle, Wash. (MA 4-3017) A. M. Mitrovich, L. R. Hennings

Syracuse, N. Y. (GR 4-5311, Ext. 1125) M. E. Damon

Torrance, Calif. (Los Angeles, NE 6-5704) R. E. Gates, C. E. Walden, Don Ensch, G. M. Armstrong

Tulsa, Okla. (RI 2-1704) W. D. Barwick

ROME CABLE

Why General Filter is EVERYWHERE

Everywhere in the nation you'll find General Filter water and waste treatment equipment giving complete satisfaction to municipalities and industries. Here's why: **DEPENDABILITY** — the result of more than twenty years' experience in building quality water process equipment. **ECONOMY** — proved by long life and trouble-free operation of General Filter plants. **SERVICE** — by 45 sales offices and 36 field service departments coast-to-coast. There are many other reasons why it pays to specify General Filter. Write for complete information, bulletins and free estimates.

GENERAL FILTER CO.
WATER PROCESS EQUIPMENT AMES, IOWA

AERATORS • FILTERS • SOFTENERS • CLARIFIERS
FLASH MIXERS • FLOCCULATORS • PNEUMATIC CONTROLS
ROTARY DISTRIBUTORS • SLUDGE SCRAPERS

very well, and it will be passed on to AIA Headquarters for release.

To relieve the concern of those architects who are readers of your magazine, and apparently there are many, some reference might be made to it in one of your issues.

The architects and engineers are striving through their joint committees to improve relations between the design professions. We have made great progress creating mutual respect for the talents and special qualifications of the several professions in this group.

This clarification is a minor matter but it removes any possible inference of unfair claims for compensation on the part of the engineering professions.

Roy F. Larson, FAIA
Co-Chairman
AIA-EJC Joint Committee

Error Noted

Sir:

This letter is to convey my thanks to you for publishing my article "Small Computers for Small Firms" in your February issue.

There is one minor correction that should be made. The second line in the left hand column of page 120 should read "8 *micro* seconds." This error occurred between my original submission of the article and the published product.

If any questions arise about the article I shall be happy to try to answer them.

William A. Briggs
Burgess & Niple

Good Illustrations

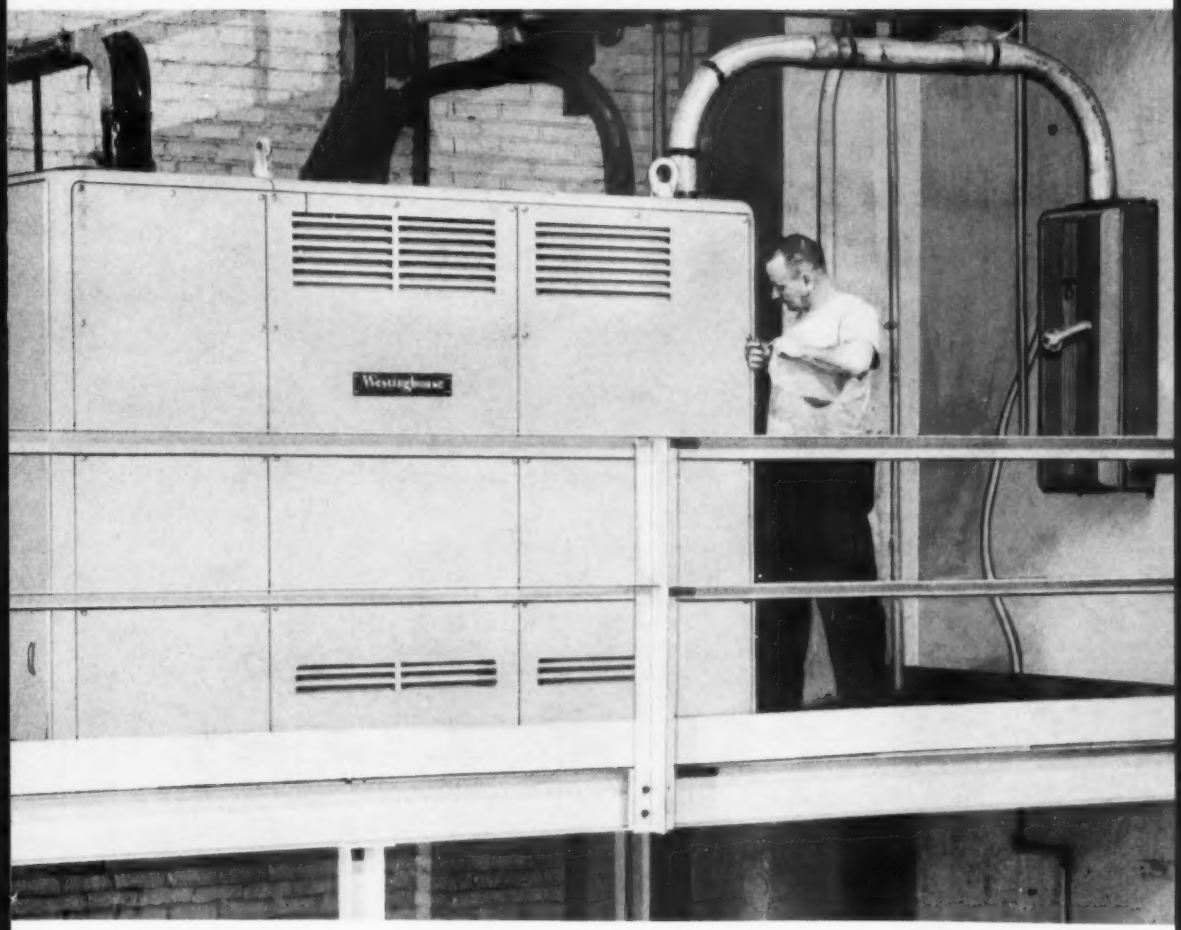
Sir:

I am completely grateful for the excellent presentation of the story on coal in Vietnam, in the February issue. I feel that the illustrations suggestive of the pictures I sent over afford a much more interesting atmosphere as background than the pictures themselves, and just as accurate. Our collective compliments to Mr. Rogers, your artist.

Clayton G. Ball
President, Paul Weir Company

four types of Power Centers meet every application

Choose From the Westinghouse Full Line...

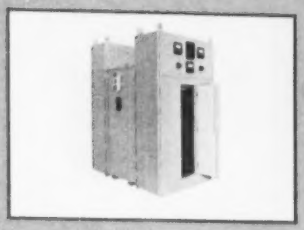


If you have a power distribution problem — whether a change-over to higher voltage or a complete modernization of existing facilities . . . indoors or out . . . a safe or hazardous location . . . clean or dust-laden atmosphere — there's a Westinghouse self-contained Power Center to fit your application.

The economics of future power growth in your plant demands flexibility. Self-contained Westinghouse Power Centers deliver it — let you handle present loads economically, while allowing for expansion . . . Here is a *full line* of Power Centers — liquid-immersed, ventilated dry-type and sealed dry-type — that makes it easy and economical to POWER-UP for greater production.

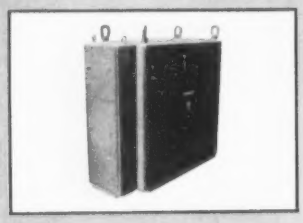
Whether liquid-immersed or dry-type, the transformers in Westinghouse Power Centers are of superior construction — from [illegible]

when you select a Power Center... how important is single responsibility?

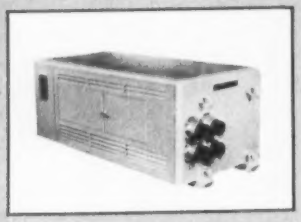


Liquid-Filled
112½ through 2000 kva, 15 kv and below

Ventilated Dry-Type
45 through 2000 kva, 15 kv and below



Sealed Dry-Type
300 through 2000 kva, 15 kv and below



Mine
(liquid-filled and dry-type)
45 through 750 kva, 15 kv and below

For Engineering

When you order a Westinghouse self-contained Power Center, every component is coordinated — transformer, switches, breakers, panelboard and related accessories — as true work-together equipment.

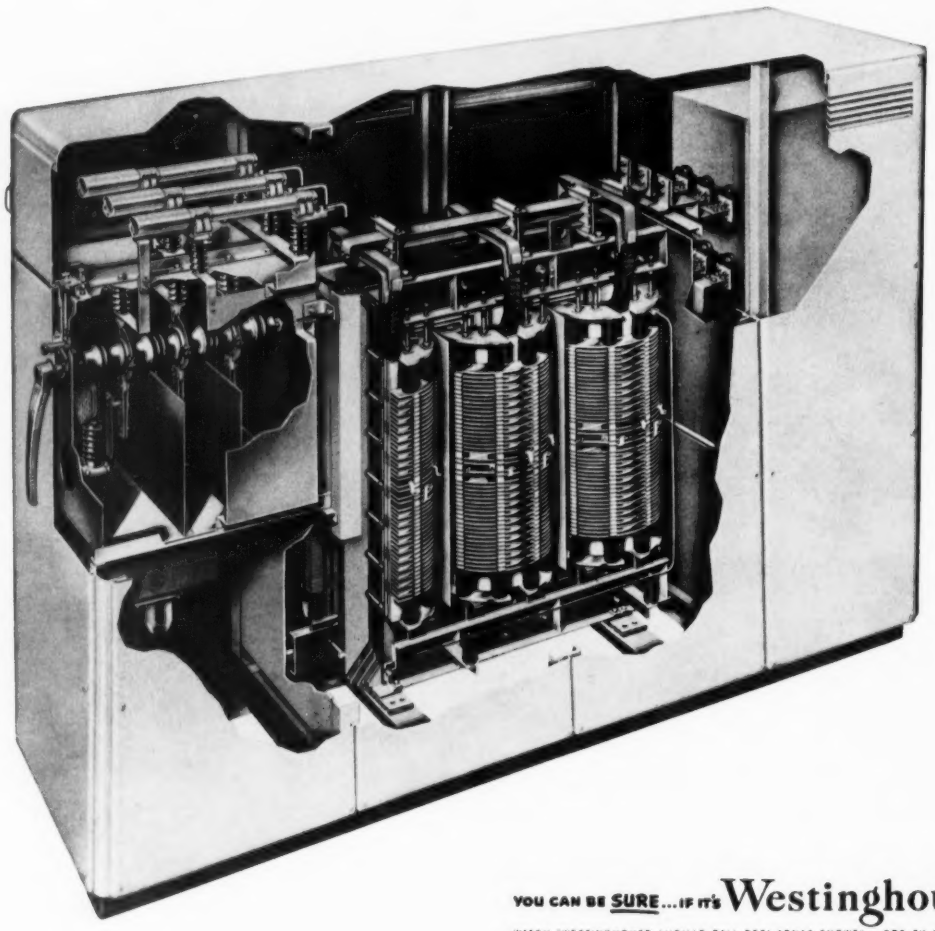
For Manufacturing

Each component is also coordinated through manufacturing and delivery. All components are built, assembled, tested and delivered together — in one compact unit . . . with one responsibility for all.

For Field Service

Proper functioning of all components of the Westinghouse self-contained Power Center is the responsibility of a single company with one of the country's most extensive field service organizations. Field service of all Westinghouse Power Center components rests solely with Westinghouse.

Check your electrical system with a Westinghouse Power Chek-Up Kit. If excessive losses, poor regulation and obsoleted equipment are adding to your power distribution costs, chances are that you need to POWER-UP — the *modern* way — with a *modern* self-contained Power Center from the Westinghouse full line. Your contractor, your Westinghouse distributor or local representative will be glad to discuss means for solving your plant distribution problems. JI-70886

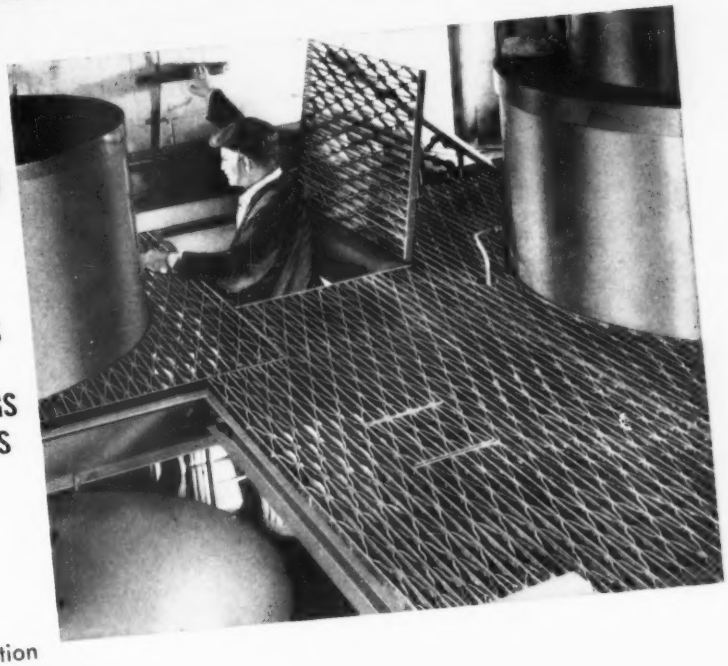


YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

WHATEVER YOU ARE BUILDING

? INDUSTRIAL PLANTS
? POWER PLANTS
? WATER-SEWAGE PLANTS
? PUBLIC BUILDINGS
? COMMERCIAL BUILDINGS
? PETRO-CHEMICAL UNITS
? BRIDGES
? HIGHWAYS
? SHIPS
? HOUSING



...there may be a grating application that can save you time and money and improve the project. As founders of the grating industry, with over half a century of experience, the Irving Grating Company is well qualified to recommend designs to help you solve specific problems.

★

We are manufacturers of Riveted, Pressure-locked and Welded Gratings in Steel, Aluminum and other metals.

★

TYPICAL USES OF IRVING GRATING:

Open Steel Flooring • Safety Treads • Floor Armoring
Walkways • Trench Covers • Balconies
Loading Platforms • Vestibule Mats • Sun Deflectors
Bridge Decking • Draingrates • Contour Retainer
Grid for Refractory Shells

★

SOME OF THE ADVANTAGES:

Self-Cleaning • Self-Draining
Permits passage of light and air • Lightweight
Strong • Will last indefinitely • Fireproof
Resists Corrosion • Simple to Install
Minimum maintenance • Custom built

IRVICO®

Representatives in Canada and Mexico

IRVING SUBWAY GRATING CO., Inc.

ORIGINATORS OF THE GRATING INDUSTRY – EST. 1902

Offices and Plants at:
5056 27th St., LONG ISLAND CITY 1, N. Y.
1856 10th St., OAKLAND 20, CALIFORNIA

For location of the nearest Irving Sales Engineer consult your local Classified Telephone Directory in principal cities

Teaching really "takes"

when classroom weather is fair

School officials are becoming increasingly aware of the close relationship between peak learning efficiency and correct comfort level. With the Nesbitt System, you offer school administrators the opportunity to upgrade academic achievement through controlled classroom climate. And, with Nesbitt, you can show savings of 20% or more on construction, installation and equipment costs.

ESSENTIALS OF THE NESBITT SYSTEM

The system combines the Nesbitt Syncretizer unit ventilator for every classroom with Wind-o-line radiation installed along the sill. The Syncretizer automatically provides the heating, natural cooling and draftless ventilation for each classroom, exactly as required.

Wind-o-line radiation eliminates the dual problem of cold walls and window downdrafts, provides overnight gravity heat without other special controls.

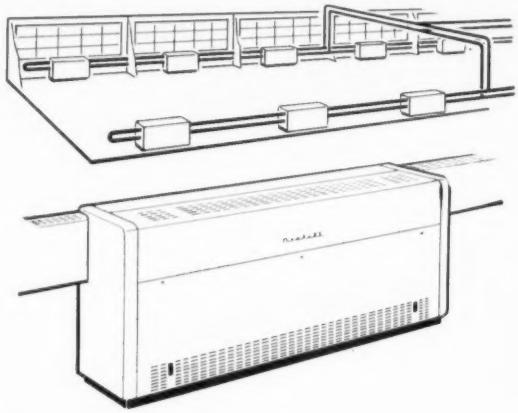
HOW THE NESBITT SYSTEM CUTS COSTS

1. The Nesbitt System provides the required heating capacity while circulating only one-third as much hot water as conventional systems. This permits the use of smaller, less expensive pipes and pumps.

2. Actually the Wind-o-line radiation takes the place of the usual supply and return mains. This eliminates costly pipe trenches, runouts and pipe insulation.

3. Factory installed crossover tubing, expansion loops and balancing valves in the Syncretizer eliminates expensive jobsite labor.

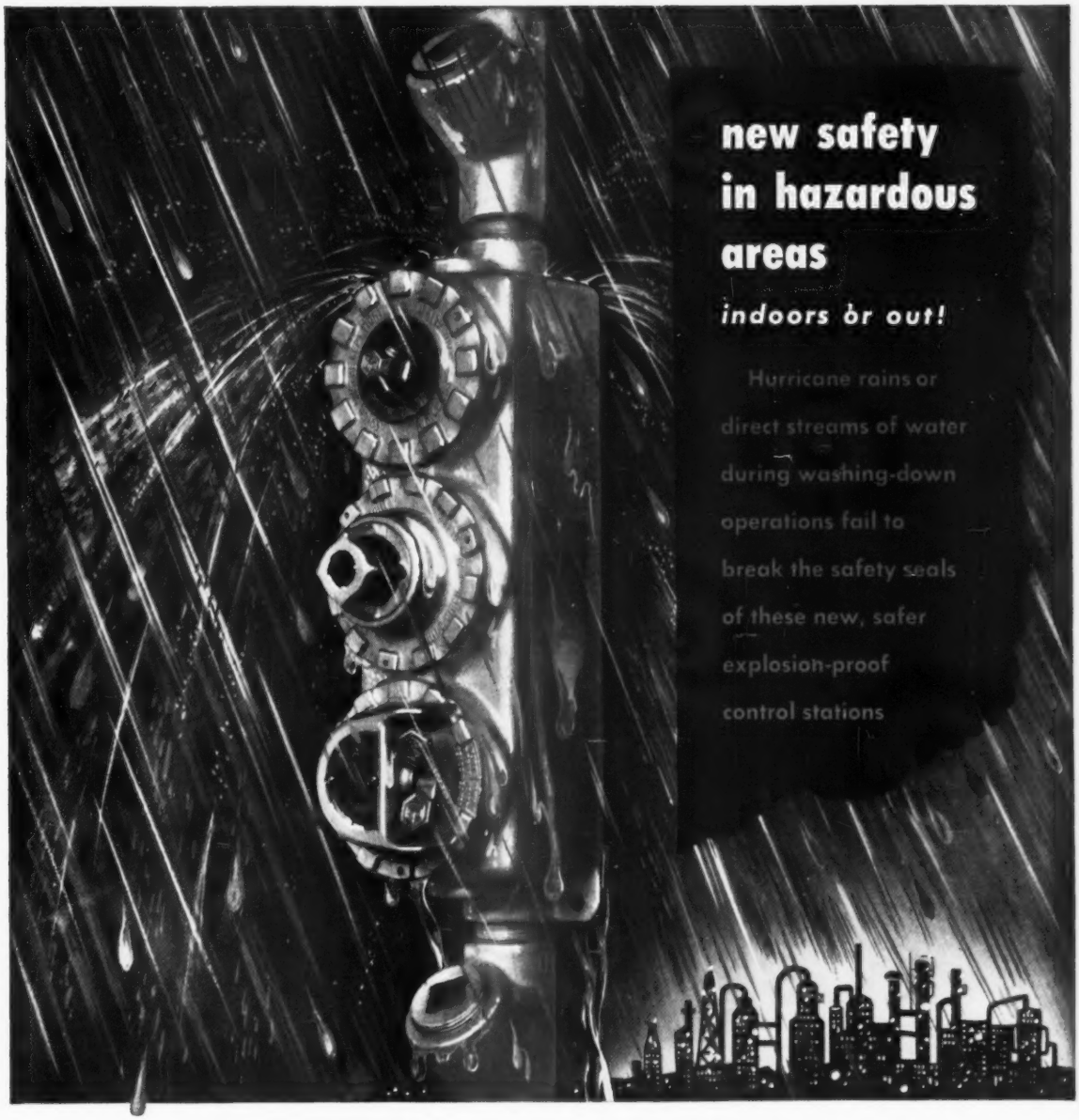
Total savings make it possible for even low budget schools to take advantage of the finest heating and ventilating system money can buy.



WRITE FOR COMPLETE CATALOGS AND ENGINEERING DATA

Nesbitt Series WIND-O-LINE SYSTEM

Made and Sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. • Also sold by American-Standard, American Blower Division and American-Standard Products (Canada) Ltd.



NEW THREADED-JOINT NEOPRENE-SEALED

Control and Indicating Stations

Explosion-proof, dust-ignition-proof, weather resistant and water-tight (NEMA 4), this new Condulet® EWC series affords safety greater than ever before for pilot lights, heavy-duty push-button stations, selector switches, or various combinations thereof in single, double or triple gangs.

Designed expressly for Class I (Groups C and D) and Class II hazardous areas, the new series features a Feraloy® housing with *threaded* cover and *threaded* operating-shafts throughout. Cover, shaft housing and pilot light jewels are tightly sealed with Neoprene O-rings, effectively shutting out fumes, dusts, all water.

Write direct for descriptive literature and specifications, or contact your Crouse-Hinds distributor

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK

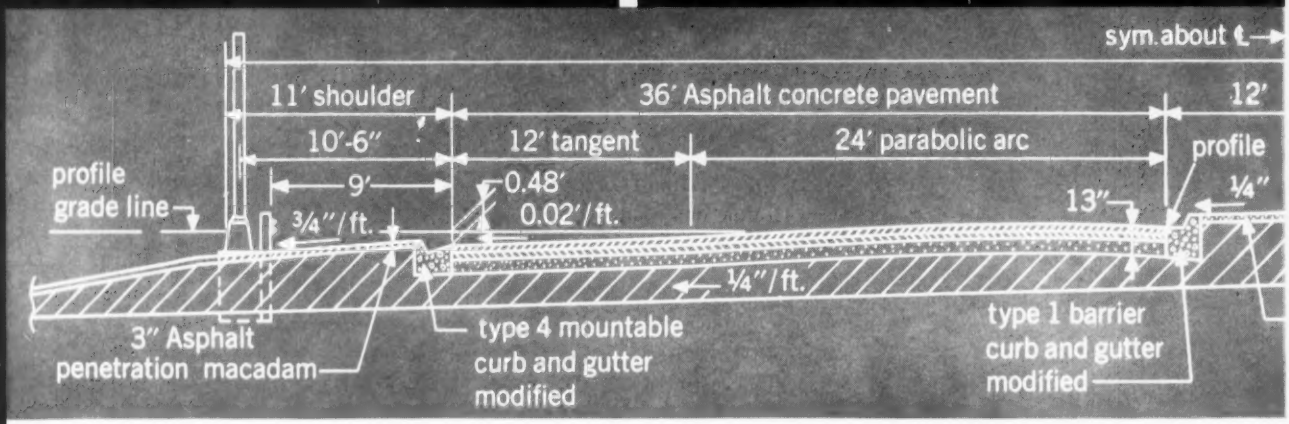
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Maryland

● CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) ● FLOODLIGHTING
● TRAFFIC CONTROL SYSTEMS ● AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT ●

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Baton Rouge, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Washington. **Resident Representatives:** Albany, Atlanta, Baltimore, Charlotte, Chattanooga, Jacksonville, Reading, Pa., Richmond, Va.

To lay Asphalt concrete on bridge decks in winter the contractor used three, 12-foot finishing machines. By paving simultaneously cold longitudinal joints were prevented. Finishers were followed immediately by 2- and-3-axle tandems.

One-inch binder course is compacted by tandems. Self-propelled pneumatic-tired roller ballasted with ten tons of sand complete compaction. Ordinary household detergent in water prevented Asphalt pick-up by rubber tires of the heavy equipment.



Chicago's Calumet Skyway proves it!

Modern, durable, Asphalt paving

Paving of the Windy City's 7.7 mile Calumet Skyway; an elevated, twin-36-foot-lane toll facility; started in October 1957. By April 16, 1958... just six months later... it was opened for traffic.

Mind you, the job was done in midwinter and had to be paced to the completion schedules of fill and bridge sections.

It is safe to say that when laid down in midwinter at this speed only modern Asphalt concrete construction could have satisfied the engineering standards for this pavement structure. Competitive bidding established that Asphalt concrete was also the least expensive material.

To the direct construction savings, resulting from the speed and low cost of Asphalt paving, must be added extra revenue realized by the ability to open this toll facility in time for 1958 summer traffic.

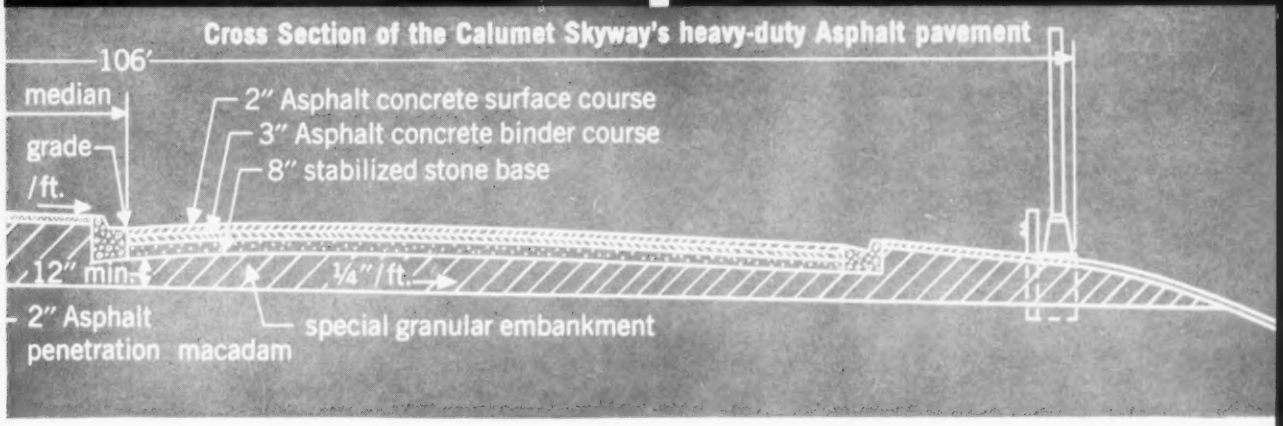
The road's designers point out that modern Asphalt construction also provides the desired durability, minimum maintenance, minimum traffic noise, fast melting of snow and ice with no trouble from deicing salts.

Asphalt concrete is easily the most versatile paving material.

In this example Asphalt concrete proves out on 18-foot

Specially-equipped trucks bring mix to finishers. Insulated truck beds and tarpaulin covers protect mix, bring it to job at best laying temperature. Canvas aprons on spray bars of distributors keep prime from blowing on curbs and sidewalks.

Before and after rolling, luteman, raker and straightedge man check the mat. Despite 2-inch high expansion and contraction plates every 100 feet, mat goes down true to grade. A 13-20 ton roller irons wearing surface to final smoothness.



is done at record, tax-saving speeds

fill and on bridge decking. In Louisiana it is performing well over virtual quagmires. In Ohio, it proves ideal on glacial till. In New England, it has taken years of alternate freezing and thawing in its stride. Along Oregon's rainy coast Asphalt concrete is the only paving that lasts. In the Southwestern desert regions, where eggs can be fried on road surfaces, Asphalt concrete is by far the preferred pavement. In mountainous terrain, Asphalt concrete is the easiest material to lay and it conforms to foundation settlement without fracturing. In New Jersey, it was selected to handle the world's heaviest turnpike traffic loads ... 4,012,815 vehicles in July 1958 alone.

Under all these conditions and more, modern Asphalt concrete has proved itself the least costly pavement to build and to maintain. When you specify it, you make your state's road-building tax funds go **much** further.

Ribbons of velvet smoothness ...
***ASPHALT**-paved Interstate Highways*

THE ASPHALT INSTITUTE
Asphalt Institute Building, College Park, Maryland

The Readers' Guide

Down Draft Doors

(page 108)

We have long been strong boosters of the air door, or curtain of air, for entrances to buildings. Our psychologist tells us this goes back to our youth, spent in amusement parks watching a blast of air raise the skirts of the girls in the fun house. Our enthusiasm was dampened considerably when we learned from an article in this issue that the air moves down, not up, in modern air door design. Also it is a gentle breeze not a quick blast that separates the inside of the building from all outdoors. The author tells us that this air curtain idea has worked well in a number of installations including one he describes in some detail – the Pan American passenger building at Idlewild – and he suggests a great many yet untried possibilities for consulting engineers to investigate.

Rapid Transit

(page 92)

and

Old Roads

(page 114)

We have this month two articles on transportation – but they are separated by a full century and a half. One has to do with the type of rapid transit required by the super cities of today and tomorrow, while the other tells of the early days of our first interstate highway, the old National Road, which ran from Cumberland, Maryland through Wheeling, Virginia (now West Virginia) and from there almost to the Mississippi. Different as they are, both deal with great mass movements of people – one with the daily shift from the suburbs to the city and back home again; the other with the movement of a large part of a whole population from the East, over the mountains, to the West. Irvan F. Mendenhall, of Daniel, Mann, Johnson & Mendenhall, is the expert author of the article on rapid transit. As a native of Los Angeles, he knows the transportation problems of super cities, and he has come up with several excellent suggestions for their solution. The article on "The Old National Road" was done by Tom Probst, a fine writer with the ability to inject a lot of human interest into his reviews of engineering activities of the past.

Pipe In Concrete

(page 104)

As A. W. Peabody, of Ebasco Services, Inc., says it can be quite discouraging to find your client's pipes are leaking, particularly when those pipes are radiant heating lines overlaid with a thick slab of concrete. Need not happen, says Peabody. It is simply a matter of having them installed properly so that they are completely surrounded with concrete, not half in concrete, half in some damp soil or insulating material. It is a lot less trouble to put the pipes in right than to break up the concrete to repair leaks a year or so later – and much less embarrassing. Better have a look at "Pipe in Concrete Need Not Corrode," then go forth and sin no more.

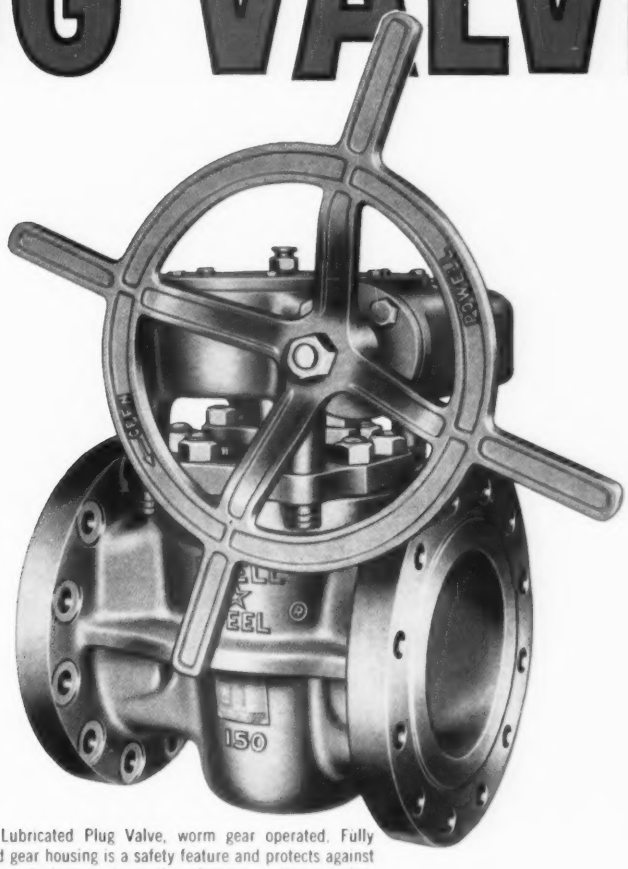
Lecture from London

(page 126)

A most distinguished consulting engineer is among our authors this month. The "Report from London" is written by Mr. Julian Tritton, president of the International Federation of Consulting Engineers (FIDIC). It seems that Mr. Tritton recently presented an address before the Royal Society of Arts, and his subject was "The Consulting Engineer and His Contribution to the National Economy." The lecture was given under the chairmanship of the Minister of the Board of Trade, and Mr. Tritton says that his prime purpose was to inform prospective clients, public and private, of the role of the consulting engineer, telling the government and business people the way the consultant gets for them a better job at lower cost. Mr. Tritton includes in his "Report from London" a condensation of his talk so that American consultants can see what kind of a sales story the British engineer has to tell. We can take a few leaves from his lecture for presentation to our own clients.

POWELL

LUBRICATED PLUG VALVES



Powell Lubricated Plug Valve, worm gear operated. Fully enclosed gear housing is a safety feature and protects against injuries and damage from the elements and tampering.

Like all Powell Valves, Powell Lubricated Plug Valves are superior in their field . . . and have many advantages over conventional types of Valves:

- Simple design: Only three basic parts—Body, Bonnet, Plug.
- Quick, complete shut-off.
- Tapered plug assures positive seating.
- Machined surfaces of plug and body are not exposed in open position.
- Cavity-free straight passage assures streamlined flow.

Powell Lubricated Plug Valves are available in sizes ½" through 16", depending on the type required—Semi-steel 175 and 200 pounds WOG; Carbon Steel ASA 150 and 300 pounds.

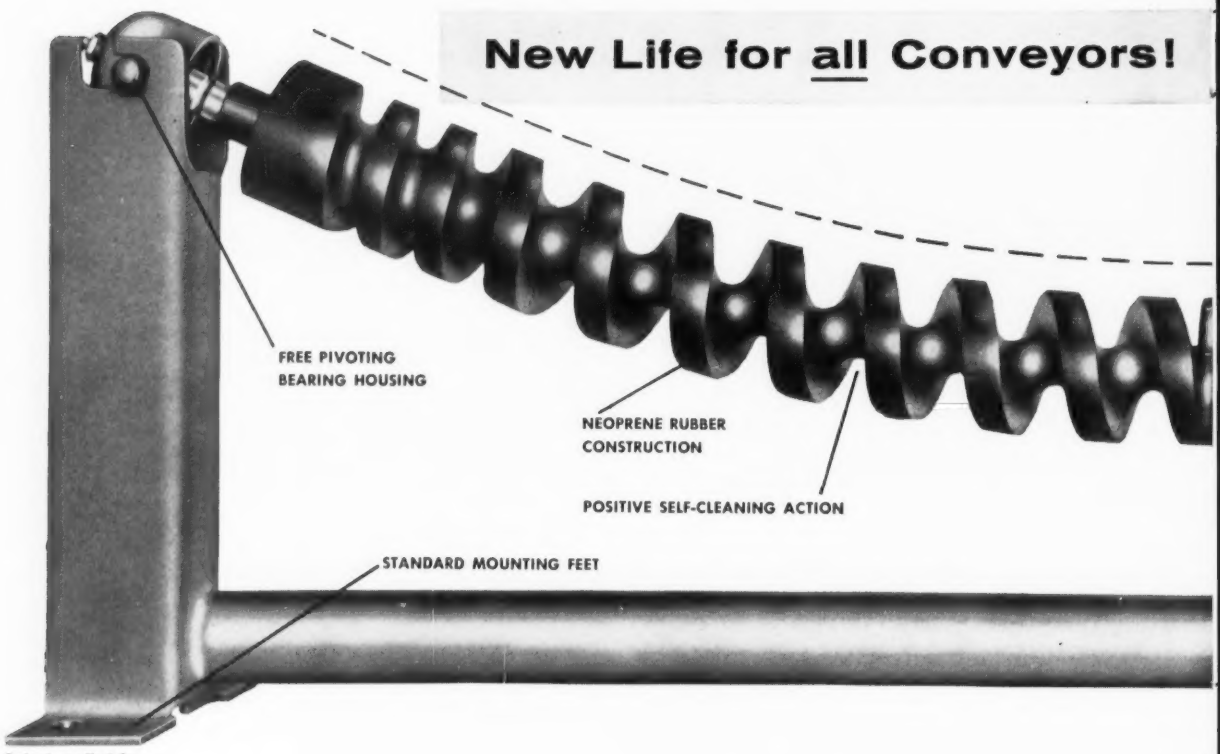
Powell can also furnish Lubricated Plug Valves in other alloys on special order.

For all your valve needs, consult your local Powell Distributor—or write directly to us. Send for our new Lubricated Plug Valve Catalog, Number PV-5.

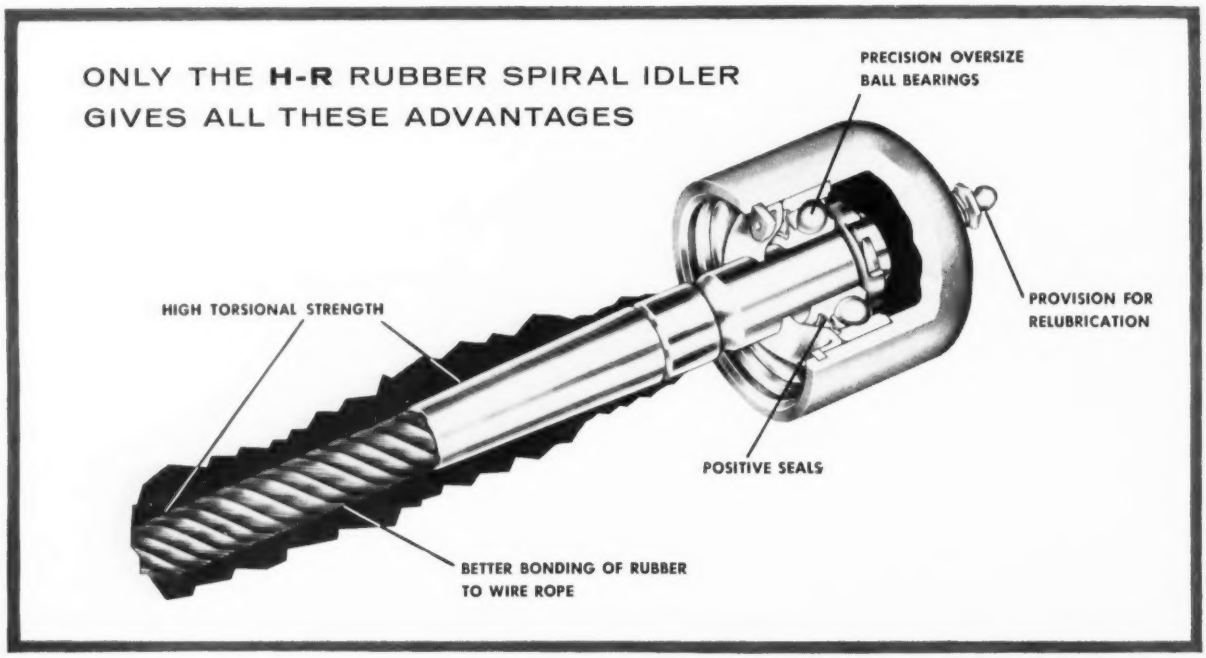
The Wm. Powell Company • Cincinnati 22, Ohio

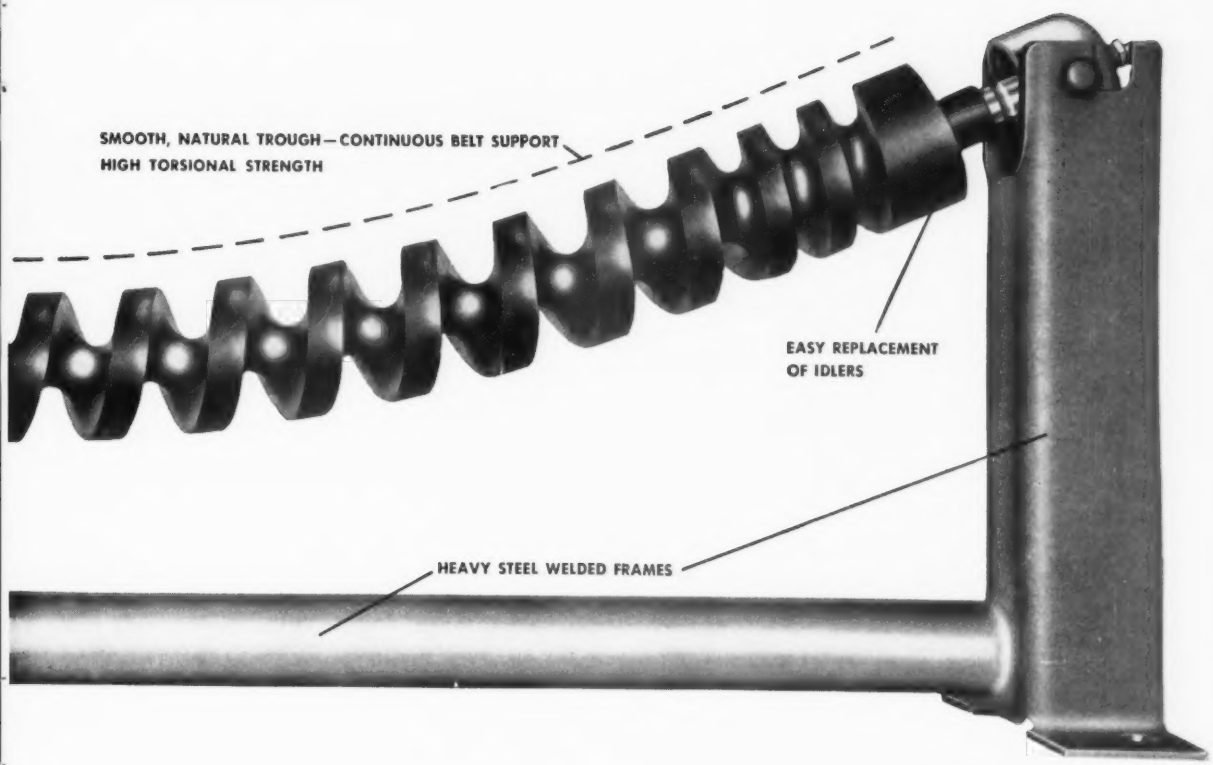
Dependable Valves Since 1846

POWELL...world's largest family of valves



Revolutionary HEWITT-ROBINS Corrosion, Abrasion, and





Rubber Spiral Idler Defies Build-up of Material

Here's the conveyor idler built to last longest in punishing corrosive atmosphere or extreme abrasive service! What's more, its exclusive self-cleaning rubber spiral prevents build-up of sticky, hard-to-handle materials!

The numerous design and construction advantages of this new Hewitt-Robins idler are shown in the illustrations. Here's what they mean to you in terms of cost-cutting, time-saving, operating advantages.

● **LONG LIFE.** Neoprene spiral, completely covering wire rope, prevents attack in corrosive atmosphere. Uninterrupted spiral gives smooth flexing, maximum strength. Precision sealed bearings can be relubricated for still longer life.

● **SELF CLEANING.** As the spiral turns, it "works" any material out of the grooves as they change shape. This action is most effective with sticky materials which tend to build up on common types of idlers.

● **CONTINUOUS BELT SUPPORT.** The exclusive rubber spiral design "moves" along the entire width of the belt; therefore, pinching and sharp bending of the belt are eliminated.

● **SELF TRAINING.** Belt training problems are greatly reduced by readily conforming rubber spiral, and by elimination of material build-up.

● **EASY REPLACEMENT.** The spiral, wire rope, and bearing assembly simply lifts out of its brackets—no tools are needed. The complete idler fits standard conveyor stringers.

● **TRUE OPERATING ECONOMY.** Under conditions where conventional idlers fail prematurely, the Hewitt-Robins rubber spiral idler will pay for itself many times over.

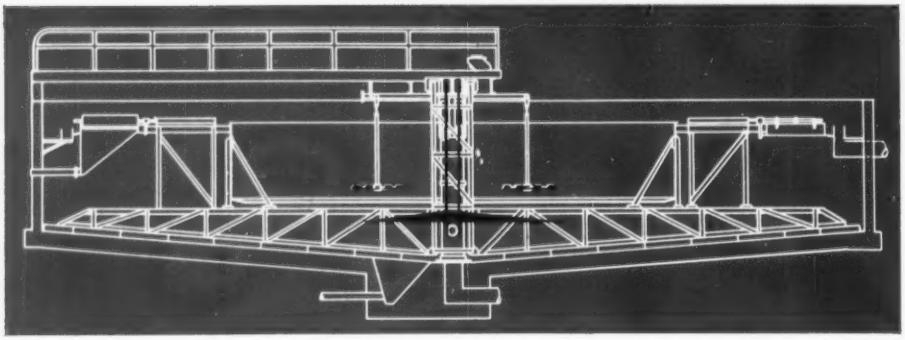
Deliveries of this revolutionary new idler are now being made in 18, 24, 30, and 36 inch belt sizes. In addition to the type shown, it is also furnished with a spreader frame for use in wire rope conveyor systems. For further information check your H-R distributor, or write Hewitt-Robins, Stamford, Connecticut. Ask for Bulletin 3-13.

HEWITT-ROBINS

THE NAME THAT MEANS EVERYTHING IN BULK MATERIALS HANDLING SYSTEMS . . .

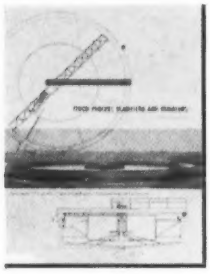
CONVEYOR BELTING AND IDLERS • POWER TRANSMISSION DRIVES • INDUSTRIAL HOSE • VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

Another Eimco-Process design innovation . . .



Internal sludge recirculators, Non-Clog Diffusers and a sludge thickening deflector are exclusive features of the Type CA Oxidator.

EIMCO-PROCESS OXIDATOR®—WITH CONTROLLED INTERNAL SLUDGE RECIRCULATION—INCREASES SOLIDS AND BOD REMOVALS



The complete line of Eimco-Process Oxidators, Clarifiers and other sedimentation equipment is described in our new Bulletin SM-1005. We will be happy to send you a copy on request.

Developed and introduced by Eimco-Process, and with a number of exclusive features, the Oxidator combines aeration, flocculation and sedimentation in a single circular tank. When aeration and flocculation of the solids are provided prior to clarification, many finely divided and colloidal solids that could not be removed by conventional sedimentation are flocculated and collected with the sludge. The aeration keeps the influent fresh and, combined with controlled internal sludge recirculation, gives increased floccule size, minimizes scum formation, and gives increased suspended solids and BOD removals.

In this unique design, internal sludge recirculation is accomplished through airlifts with intakes below the special sludge pocket protection deflector. By placing the intakes in this protected heavy sludge zone and controlling each lift with a separate valve, optimum recirculation rates can be obtained.

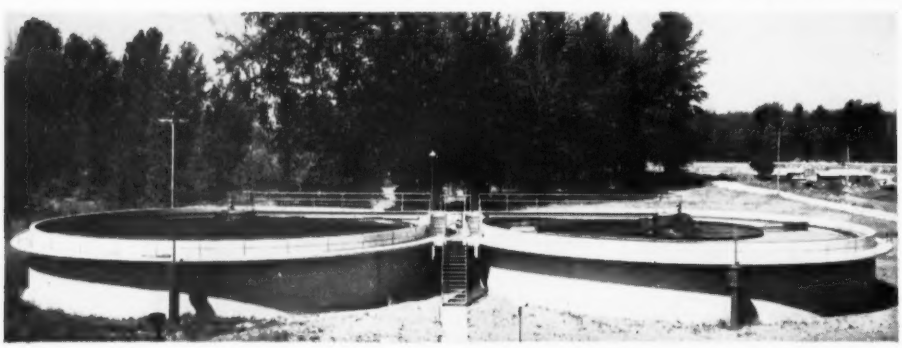
Gentle or intense aeration, adjustable sludge recirculation rates and controlled sludge thickening make the Oxidator the most flexible of all sedimentation equipment. Used alone, it can provide economical intermediate treatment; used with secondary equipment, it can substantially reduce total plant investment.

THE EIMCO CORPORATION
Salt Lake City, Utah

B - 394

PROCESS ENGINEERS, INC. *division*
420 Peninsular Avenue
San Mateo, Calif.

. . . another outstanding installation



Two 75 ft. dia. Type CA Oxidators, Puyallup, Washington. Consulting Engineers—Gray and Osborne, Yakima, Wash.

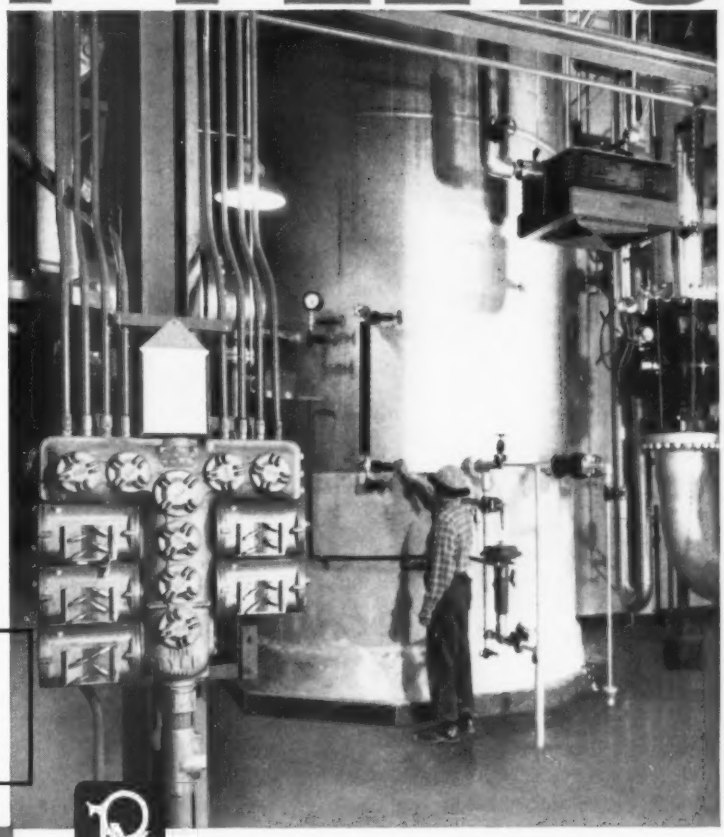
explosion-proof PYLETS®

specified for McMahon Gas Processing Plant Fort St. John British Columbia

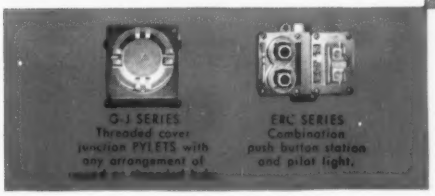
Explosion-proof PYLETS exceed code requirements and provide maximum protection for personnel and property against explosion and fire.

PYLETS are designed for quick, easy installation and convenient maintenance. Rugged construction insures a long service life.

- **Taper tapped hubs**
- **Smooth, roomy interiors**
- **Quick acting joints**
- **Dependable Mechanisms**
- **Aluminum alloy or heavy cadmium plated ferrous alloy castings**

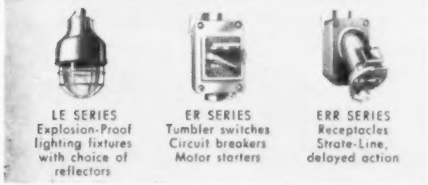


Pyle-National panelboard, lighting fixtures, and other Pylets in Absorption & Dehydrating building, McMahon Gas Processing Plant. Stearns-Roger Engineering Co., Ltd. specified Pyle-National controls, conduit fittings and lighting fixtures throughout.



GJ SERIES
Threaded cover junction PYLETS with any arrangement of

ERC SERIES
Combination push button station and pilot light.



LE SERIES
Explosion-Proof lighting fixtures with choice of reflectors

ER SERIES
Tumbler switches Circuit breakers Motor starters

ERR SERIES
Receptacles Strate-Line, delayed action

SINCE 1897

Sold Nationally Through Authorized Distributors. Write for Literature.

THE PYLE-NATIONAL COMPANY

WHERE QUALITY IS TRADITIONAL

1337 North Kostner Avenue, Chicago 51, Illinois

Branch Offices and Agents in Principal Cities of the U. S. and Canada
Railroad Export Department: International Railway Supply Co., 30 Church St., New York 7, N. Y.
Industrial Export Department: Rocke International Corp., 13 E. 40th St., New York 16, N. Y.
Canadian Agent: The Holden Co., Ltd., Montreal

CONDUIT FITTINGS • MOTOR CONTROLS • CONNECTORS • FLOODLIGHTS

From the Editor's

Tranquil Tower

WE RECEIVED some good news a few days ago from Julian Tritton, president of the International Federation of Consulting Engineers (FIDIC). The Consulting Engineers Council, of the United States, was formally accepted as a member at the meeting of FIDIC's executive committee held in Zurich late in January. This means that the U.S. is FIDIC's second member outside of Europe (New South Wales was accepted as a member a few months ago) but the U.S. application was acted upon but a few minutes ahead of the application of the Union of South Africa. Not only have these three associations from three widely separated continents suddenly become a part of a world organization of consulting engineers, but Canada's application was accepted subject only to the approval of the Annual General Assembly, which meets May 28-30, in The Hague.

For more than 20 years, FIDIC was a purely European federation of consulting engineer associations. No doubt it will remain strongly European controlled for many years (as it should) for the associations from Western Europe have experience with and the special knowledge of Federation activities. The United States, South Africa, New South Wales, and Canada cannot expect to step in and start running the organization, but they can participate and contribute to the good of the whole. It is also conceivable that one of these new members might next year or the year after have a delegate on the Executive Committee.

Now that FIDIC is truly a world organization of consulting engineers, it can be expected to become more active and more influential than it has been in the past. Its accomplishments during the three years under Mr. Tritton's presidency have been notable, particularly in the preparation and adoption of an excellent set of conditions of contract for international civil engineering projects.

Now, with its increased membership, the Federation should be able to go on to find solutions to the important problems of competition from manufacturers and contractors. Perhaps some sort of intensive program by FIDIC also could effectively point out to both government and private clients that a project is better handled if design and specification is by a competent engineer who has no commercial connections. This is one of the major problems of the consulting engineers in associations now brought together in FIDIC, and it is not a problem confined to any one nation.

Every industrially advanced country has its share of manufacturers who are happy to toss in "free engineering" in return for a large and profitable machinery or materials order. This makes it all the more necessary for solutions to be found through international cooperation.

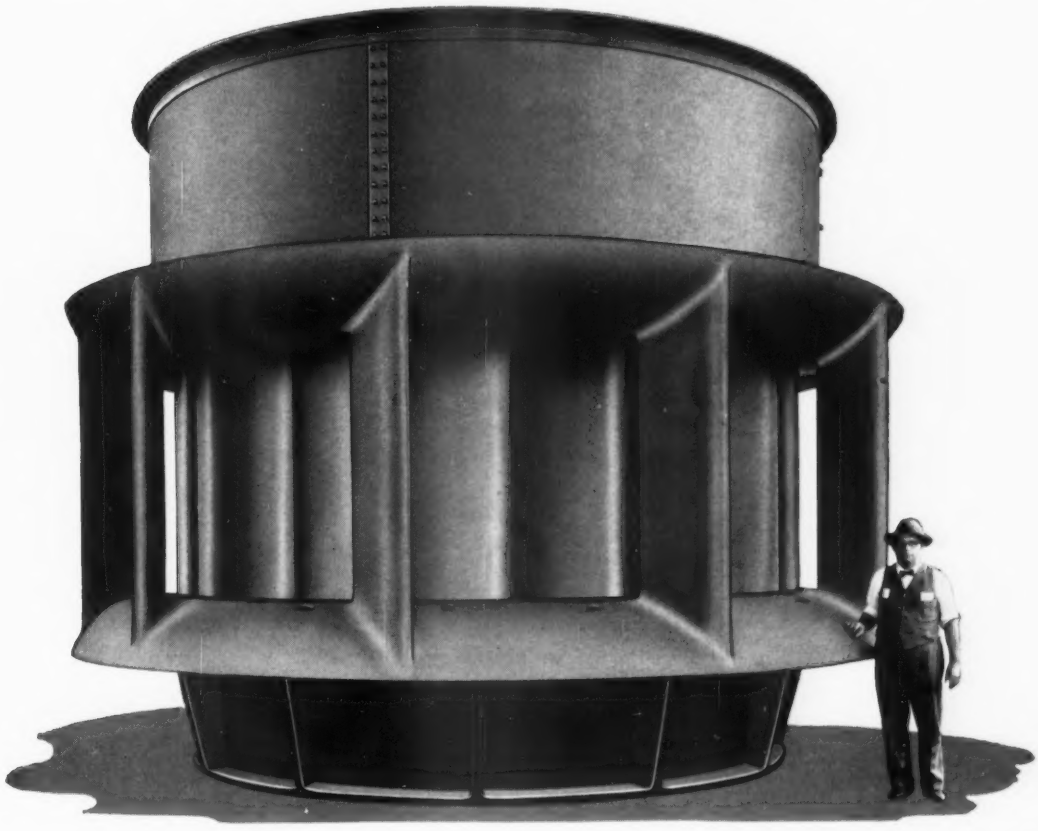
Much more vital than engineer-manufacture competition is the fact that we are now in a hot economic war with Russia, and the governments of all the free, technically advanced nations, including our own, know that to win this war we must expand our commercial and industrial investment in the nations that "have not." We are not dealing only in a race for better rockets or more moon missiles. It is even more important that we whip the Russians economically by broadening our markets and increasing the "have not" nations' capacity to consume. If we do not make possible this increased consumption, Russia will.

The fact that the industrial and commercial development of all the technically backward countries would especially benefit consulting engineers is merely incidental and lucky, but it is true. Therefore consulting engineers have not only altruistic and political motivation but also personal financial incentive in fighting this economic war with the communist countries.

The Russians have made great progress technically in the past decade, but we are still better engineers and builders than they are. If the governments of Asia, Africa, and the Middle East are given their choice, they will select engineers from the United States and Western Europe over Russian engineers. All too often they are not given the choice and they have to take the Russians.

We have got to let them know we are available. We must get after those projects. This is no small town curb and gutter job, but it is not too big for us. FIDIC can help. ▲▲

A LEFFEL TURBINE IS A TITAN OF QUALITY



The technical know-how, skilled personnel, use of the finest materials available, and rigid standards of quality control closely adhered to in the modern plant of The James Leffel & Company, enable Leffel to produce the ultimate in rugged, efficient turbines of the highest quality.

Leffel's experience is derived from almost a hundred years of designing and building turbines of all types. The records show that many Leffel turbines have developed efficient, low cost, trouble-free power for more than half a century.

Leffel produces all types and capacities of hydraulic turbines for a range of heads from 3 feet to over 1,000 feet. And Leffel engineers are available to assist you, at all times, from the original planning of your project through to the actual installation of the turbine equipment.

If you're planning a new project, or the rehabilitation or expansion of present facilities, contact Leffel for fast, complete service and rugged, top quality turbines.

Mail the coupon below for complete information about the abilities and services of Leffel.

THE JAMES LEFFEL & CO.

FOUNDED IN 1862

MORE EFFICIENT HYDRAULIC POWER FOR 97 YEARS

FREE LITERATURE 1105-E

THE JAMES LEFFEL & COMPANY
DEPT. E, SPRINGFIELD, OHIO, U.S.A.

☐ Please send me more information on Leffel hydraulic turbines.

☐ Please have your representative call.

Name _____ Title _____

Company _____

Street _____ City _____ State _____

how the *Peer* is put in *Peerless Electric*®

• Heavy, rugged-duty wheels in Peerless Electric air moving equipment are completely arc welded into one homogeneous whole. No rattles or vibration from these wheels! Precision-cut, heavy-gauge steel. Assembled and welded in jigs, producing a uniform wheel size—size after size.

WRITE TODAY FOR CATALOGS!

FAN AND BLOWER DIVISION

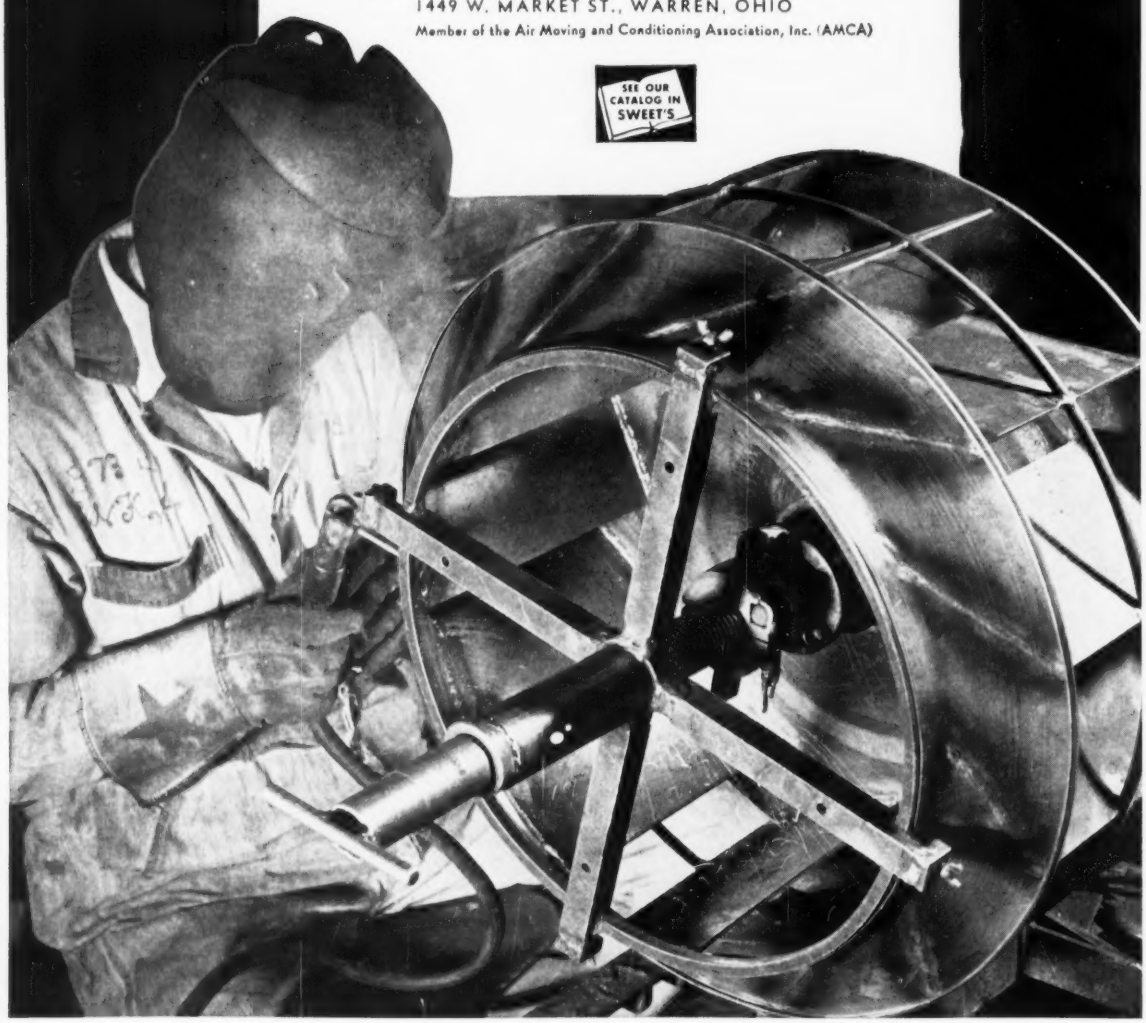
THE *Peerless Electric*® COMPANY

Also Manufacturing The Massachusetts Line®

1449 W. MARKET ST., WARREN, OHIO

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

SEE OUR CATALOG IN SWEET'S



The dramatic facade of this new Cleveland office-warehouse of E. R. Squibb & Sons, Division of Olin Mathieson Chemical Corporation, consists of 4' x 8' panels of translucent ivory PLEXIGLAS. Fluorescent tubes behind the panels provide complete luminosity at night. Letters and trademark reproductions are also PLEXIGLAS. Architects: Toombs-Amisano & Wells, Atlanta, Ga. Builder: Gillmore-Olsen Co., Cleveland.

Beautify and Identify with **Plexiglas**

The luminous facade shown above is just one of the many ways PLEXIGLAS® acrylic plastic is being used in building applications. Others are dome skylights, lighting diffusers and lenses, signs, daylight-control panels, spandrels, partitions, and decorative glazing. The reason for this variety of uses? PLEXIGLAS combines light transmission with wide color range, outdoor stability, light weight, resistance to breakage, and ability to be formed to almost any shape. Write for the names of building products made of PLEXIGLAS, and for technical information and assistance on your specific projects.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Co. of Canada, Ltd., West Hill*
Crystal Glass & Plastics, Ltd., Toronto

Mr. Smith is 600 duct feet farther from

the fan room than Mr. Jones, yet . . .

both men work comfortably at the same temperature!

when ducts are *fitted square and tight* with Johns-Manville semi-rigid Spintex Insulation

SEMI-RIGID SPINTEX® works two ways to lessen heat loss, stop condensation: first, with low conductivity . . . then, with its square, tight fit. The structural strength of this material, which is fastened snugly to duct surfaces with pins and clips, prevents "ballooning" due to duct leakage. And butted or mitred joints eliminate stretching and thinning of the insulation at corners. Instead, there's a full thickness of Spintex—with full protection against heat loss and condensation—over the *entire duct area.*

This two-way "edge" in insulating effectiveness is the big reason why leading engineers everywhere specify semi-rigid Spintex . . . for factories, institutions and office buildings of every description.

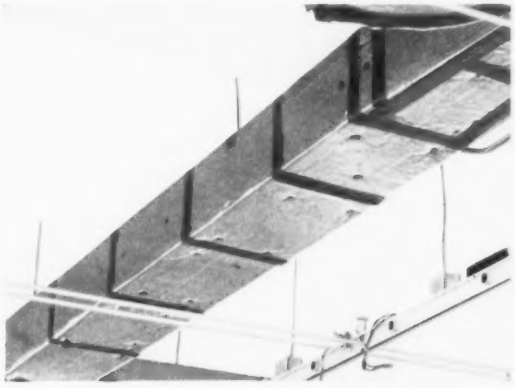
Produced by a new Johns-Manville spinning process, today's Spintex offers more insulating value than ever. Its mineral fibers are smaller in diameter, and substantially more uniform. This improved fibrous structure adds countless heat-blocking dead-air spaces per cubic inch to help keep working temperatures precisely the same throughout the structure . . . with minimum operating costs!

Your Johns-Manville sales representative will be pleased to send you information, along with samples of Spintex and J-M facing materials. Why not call him today. Or write Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ontario.

LESS HEAT LOSS...NO CONDENSATION AT CORNERS!
Semi-rigid (not flexible) Spintex fits squarely and tightly all duct surfaces. Stretching and thinning at corners, unavoidable with wrap-around insulations, are eliminated completely. Instead, Spintex retains full thickness everywhere to stop heat loss and condensation. Its structural strength prevents "ballooning."

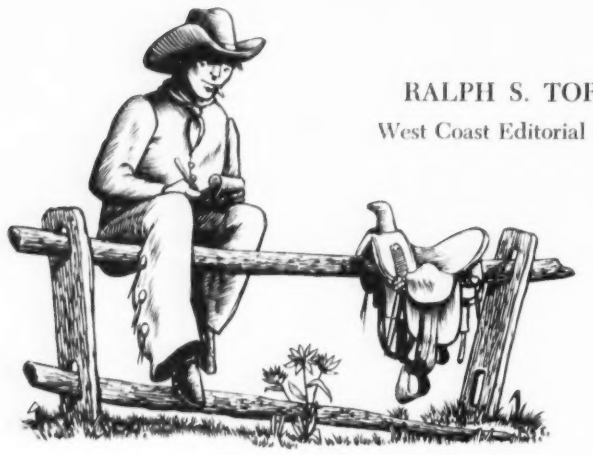
FACED FOR ANY SPECIALIZED NEED!
J-M offers you a facing to meet any vapor condition, incombustibility requirement or decorative need. Provides good base for plaster finish . . . or where no facing is indicated, Spintex presents an attractive appearance with trim, tidy joints.

INSTALLS QUICKLY . . . ECONOMICALLY.
Spintex is clean, sanitary and "friendly" to handle. It cuts readily with an ordinary knife. Installs quickly, easily, even when ducts are curved or in difficult-to-reach areas.



AIA FILE NO. 37-D-1-2

JOHNS-MANVILLE



RALPH S. TORGERSON
West Coast Editorial Representative

Report from the West Coast

THE CONSULTING ENGINEERS Association of California held its annual meeting at the Mark Thomas Inn in Monterey, California, on Jan. 25 to 27. Some of the subjects discussed at the two-day business session were legislation, problems with the State Division of Architecture, establishment of a credit and professional rating bureau, minimum standards of performance for electrical and mechanical work, professionalism in California universities, ethics and enforcement of the Engineers' Act, and establishment of better fee standards.

President Harold King, in his annual address, gave a resume' of association activities and suggested that a 30 percent increase in membership could be attained easily. The association telephone directory advertising program was considered most successful, as over 300 inquiries had resulted.

Executive secretary Pecos Calahan reported a gain of 23 members during the year, with a total of 202 on Jan. 1. Membership by field came to: 1.98 percent chemical, 24.80 percent civil, 15.30 percent electrical, 18.82 percent mechanical, and 39.10 percent structural. He also reported the association finances to be in excellent shape in spite of some heavy expenses.

Legislation

Foster Sampson presented a report on legislation. He referred to the action taken by the California Legislative Council of Professional Engineers in September ("Report from the West Coast" Nov. 1958). This report dealt with suggested legislative changes proposed to strengthen the Civil Engineer and Land Surveyors Act. It has been difficult to secure convictions in actions brought to trial, and one suggested method was the use of injunctive powers.

Secretary Calahan said that a new problem had arisen in getting bills before the legislature and checking bills to determine whether they affect the engineering profession. Formerly all new bills had to be introduced within the first two months of the session, but the rules have been changed to permit introduction of new bills throughout the life of the session. Calahan said that he would confer with Anthony J. Kennedy, counsel, and secure help in reading bills so as to get an immediate report on those affecting engineers.

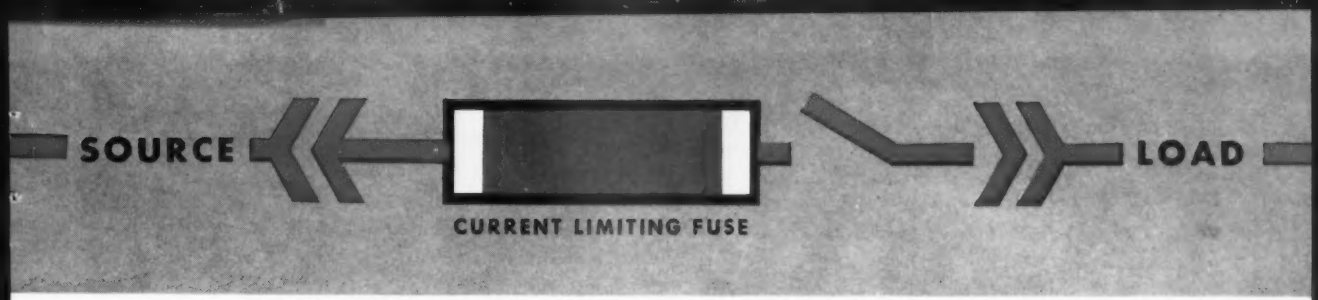
Architects-Engineers Conference

Sheldon Swickard reported on activities of the architects-engineers conference committee. This committee has no policy-making authority and can only refer to its constituent members any recommendations it may make. The question of inspection of school construction, particularly with regard to electrical and mechanical work, has been given considerable attention. The manual on inspection is to be enlarged, and a committee has been appointed to study the problem of adequate inspector training on a state-wide level.

Swickard also reported that an attempt will be made to set up an appeals board to which decisions of the State Fire Marshall can be referred, and to include an architect, engineer, and building official on the board.

The State Director of Finance has injected his office into the appointment of engineers, and members were warned against this development. Swickard suggested that the engineers should take the

Left to right: Harold King, Ralph Westcott, Chas. C. Pate, and John A. Blume.



CURRENT LIMITING FUSE ON *SOURCE* SIDE OF SWITCH FOR SHORT-CIRCUIT PROTECTION

Improved protection with

General Electric ROLLOUT

Switch and Fuse Equipment

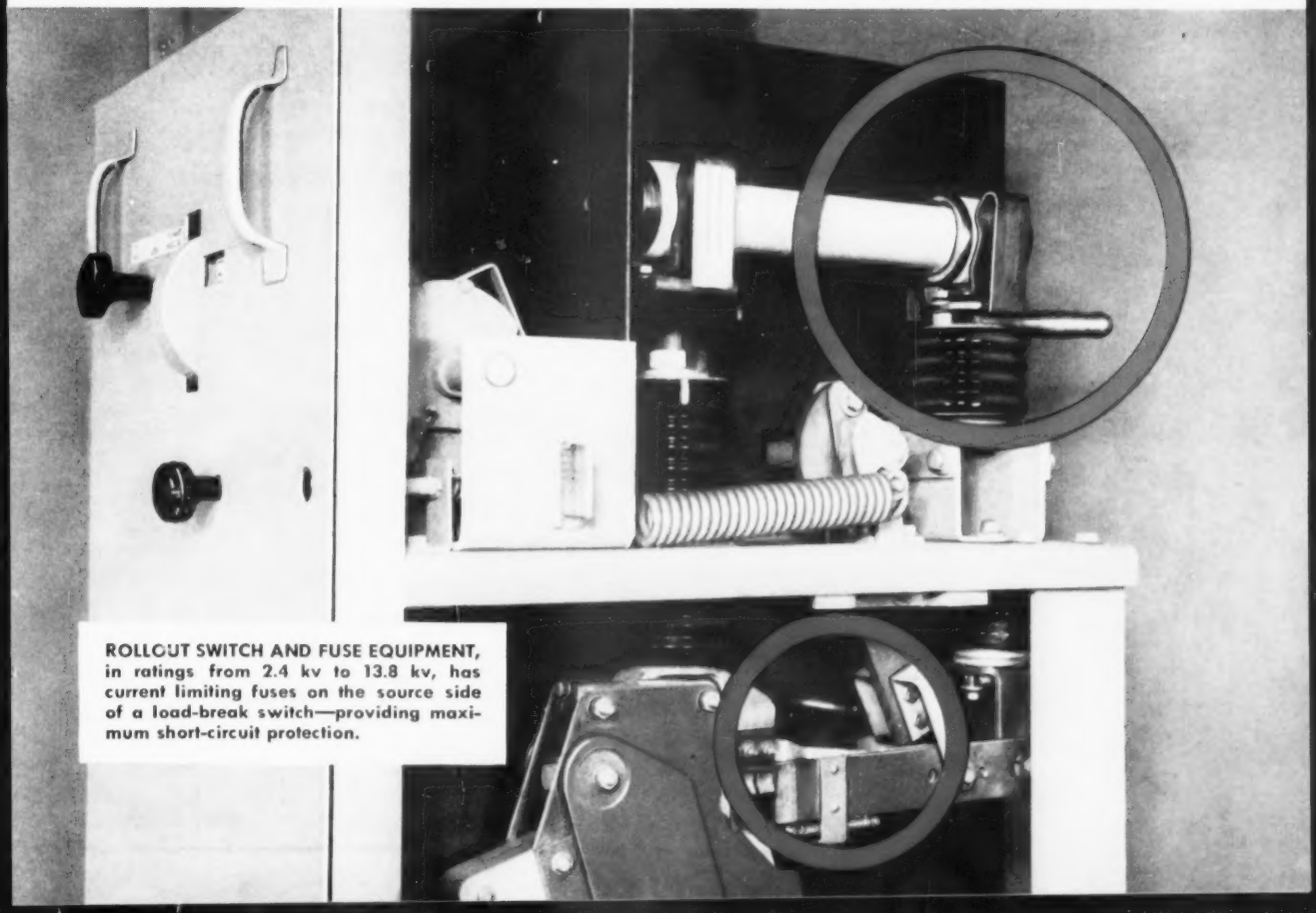
You get improved short-circuit protection with General Electric's new Rollout Switch and Fuse Equipment—because current limiting fuses are placed on the *source* side of a load-break switch.

You also get greater safety, easier maintenance and inspection, and installation versatility—with the new equipment's rollout feature.

Call your nearest General Electric Apparatus Sales Office for more information or write for Bulletin GEA-6623, General Electric Company, Section K-514-3, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, has current limiting fuses on the source side of a load-break switch—providing maximum short-circuit protection.

initiative rather than leaving it to the architects to carry the ball.

Minimum Standards

Tom Simonson presented a report on activities of the Construction Liaison Committee of California. In addition to CEAC, this committee has representatives of the Structural Engineers Association, California Council, AIA, and plumbing, mechanical, electrical, and sheet metal contractors associations. A printed report on Minimum Standards of Performance for the design, selection, and installation of mechanical and electrical work has been prepared. Defining scope of engineering is difficult, and it is felt that the standards should be augmented to include these provisions.

Bill Wheeler said that the Structural Engineers Association of Southern California is reviewing its standards to bring them up-to-date. Mark Falk told about the Steel Fabricators' upgrading of standards.

Dues Structure

Ralph Westcott reviewed the problem of establishing an association dues structure which would be based on ability to pay and might be applicable to all members of CEC. After considerable study, it was suggested that the most equitable would be a formula based on firm membership. It would start with a flat fee to secure membership, then the formula would be:

$$\text{Dues, dollars/year} = 4\sqrt{S} + \$25$$

where S is social security payments. The tentative formula was based on studies of gross income and social security data supplied by 15 engineering firms. Only the engineering work of architect-engineer firms would be included.

Westcott also presented several suggested amendments to the bylaws. One would add to the qualifications for membership, another would provide for a single slate of nominees for director instead of two for each office with provision for write-in, another would have the past-president serve as a full member of the board, and another bylaw change suggested that the director to CEC sit with the directors of CEAC.

CEC Makes Progress

Chas. C. Pate, president of CEC, was the luncheon speaker. He reviewed the history of the Council and its growth. It now has 20 association members representing approximately 1200 engineering firms, and expects associations in Montana, Pittsburgh (Pennsylvania), New Jersey, Washington, D. C., and probably Wisconsin, to join before the May meeting. Early action is planned to set up a Washington, D. C. office. Other accomplishments listed by Pate included a casebook of actual problems to supplement the Code of Ethics, efforts toward a more liberal use of private consultants in the Federal Aid Highway program, a manual of engi-

At a Large Midwestern University...

13 buildings equipped with SPENCER vacuum cleaning systems

Catalog 160—Describes Spencer Central Vacuum Cleaning Systems.

Bulletin 153C—Describes new Spencer Vaculot System.

Also Available: 20-minute color movie showing Vaculot systems in use.

Foresighted officials here . . . as elsewhere . . . know that ease of maintenance begins on the drawing board.

PLANNING IN a Spencer system . . . consisting of a centrally located vacuum producer and dirt separator, plus piping to conveniently located inlets throughout the building . . . means:

FASTER CLEANING—No time-consuming transporting of bulky equipment. Operator simply flips a switch, cleans mop thoroughly and quickly without touching dirt and goes on with his work.

BETTER CLEANING—All dirt, dust and germs are carried away through an enclosed system . . . cannot recirculate into the air.

LOWER MAINTENANCE COSTS—More floor area cleaned per man hour means smaller maintenance staff required.

ALSO MANUFACTURERS OF

PORTABLE VACUUM CLEANERS

SPENCER

The **SPENCER** TURBINE COMPANY
HARTFORD 6, CONNECTICUT

Before you O.K. any plans for metal buildings ...get the latest facts!

Compare *before* you invest. Get all the details on the most complete and flexible line of metal buildings available today—Parkersburg Metal Buildings. See how they offer the very features you *really* want—permanent construction, functional design, minimum maintenance and, above all, highest quality throughout.

Clear-span, precision-fabricated Parkersburg Metal Buildings are available in virtually any shape or size. They can be delivered quickly to your job site with all materials ready for immediate assembly. There's no field welding, no on-the-job fitting . . . for fastest, lowest cost erection.

Get all the facts before you approve any building plans. See your Parkersburg dealer today or write, call or wire for new Data Book BD-58-1

PARKERSBURG METAL BUILDINGS

THE PARKERSBURG RIG AND REEL COMPANY
BUILDING DIVISION
PARKERSBURG, WEST VIRGINIA

neering practice, a study of engineering cost factors, and a public relations program.

Architect-Engineer Relations

Mark Falk discussed the implications of the voluminous report to the legislature on the State Division of Architecture prepared by Ernst and Ernst, an auditing firm. While the report avoided a comparison of costs of government engineering with private practice work, it does recommend revisions of practices in the department. At present, State law does not allow the use of private consultants except under special circumstances. Engineers also are confronted with encroachments of the Department of Water Resources into activities which heretofore have been handled by consulting engineers.

Falk suggested that the Ways and Means Committee of the legislature be urged to have a cost system set up which would disclose actual costs in the State Division of Architecture.

Jim Stratta pointed out that on some projects, using the checking procedures of the Division of Architecture, checkers are taking precedence over the structural engineer. It was decided to set up a committee to confer with the Division on this matter.

Bill Moore led the discussion on the proposal to set up a Reference and Professional Rating Bureau. Counsel for the association suggested that if it was decided to set up such a bureau, a bylaw be added permitting this function by the association. All inquiries should be handled verbally, and there must be a legitimate interest without any malice.

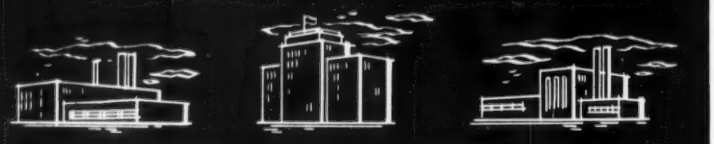
Education

S. B. Barnes led a panel discussion on professionalism in California universities. Mr. Barnes said that sales engineers, business administrators, and others in fields relating to engineering also might profit from a knowledge of proper professional attitudes. A lively discussion developed on this subject, as inquiries among California schools indicated that little or no part of the engineering courses touched on the ethics and problems of the consulting engineer.

President King said that North Dakota consulting engineers had been instrumental in starting such a course in the state university. John Blume said that while he was at Stanford, one of the professors who had a background of private practice had contributed very sound advice to students on this subject. Chas. Pate told about the Oklahoma association's work among students at the state university. Pate said that the lectures should be given by consulting engineers rather than the professors.

Steve Barnes suggested, on the other hand, that professors get experience in private practice. Bill Moore told about NSPE activities

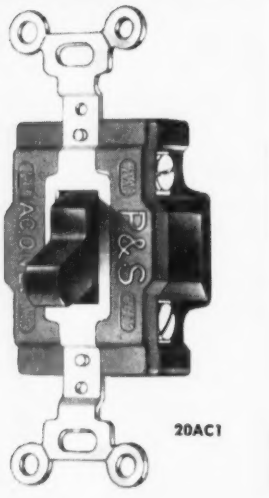
SPECIFIED
FOR RUGGED DUTY



OVER AND OVER AND OVER AGAIN

P&S

SUPER
AC
SWITCHES



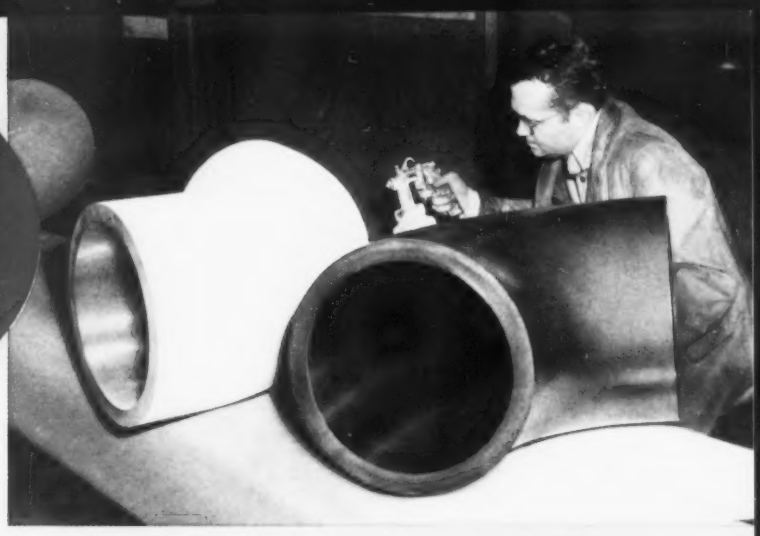
- Extra large terminal screws.
- Back or side wired.
- Extra large silver buttons.
- Can be used to *full rated capacity* on inductive loads.
- Heavy plastic body.
- Contacts in upright position mounted at point of least vibration.
- Available in 15 and 20 Amp. types.

Send for complete catalog.

P&S®
PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N.Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada; Renfrew Electric Limited, Renfrew, Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S

SPECIAL FITTINGS Need *NOT* Delay You



Entire interior and exterior surfaces of special stainless elbows for nuclear power plant are inspected with dye penetrant in search of microscopic surface imperfections. Elbows are 16" O.D. with 102° included angle and long tangent on one end.

Midwest Can Make *and* Deliver

An exclusive and flexible manufacturing process enables us to make welding fittings of any material available in plate that can be worked and welded. As plate is more readily available than pipe, in special materials and thicknesses, deliveries are much better.

Elbows with special included angles, special tangents, special wall thicknesses and of special materials are easily and promptly made. Closer tolerances are inherent in the Midwest process. Quality control always exceeds code requirements . . . can be as comprehensive as you need.

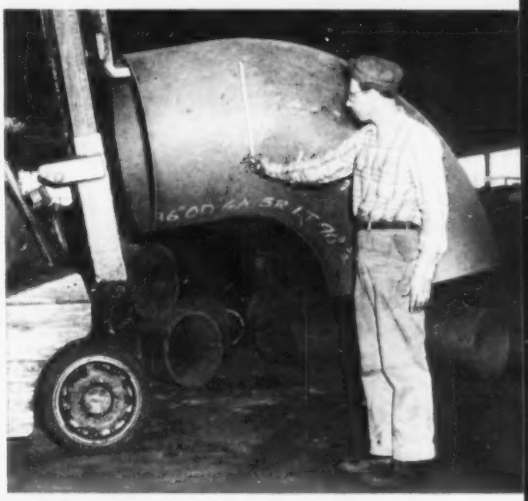
Whether or not you use specials, Midwest Welding Fittings will do a better job for you. Consult your distributor, or write us for new Bulletin 5801.

MIDWEST PIPING COMPANY, INC.

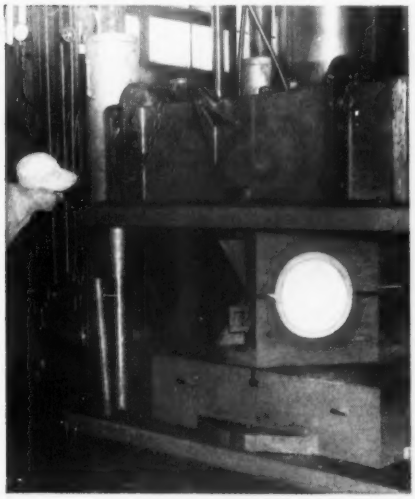
Main Office: St. Louis 3, Mo. (P. O. Box 433)
PLANTS: ST. LOUIS, CLIFTON, N. J. and LOS ANGELES

SALES OFFICES:
Asheville—(Box 446, Skyland, N. C.) • Atlanta 9—72 11th St., N. E.
Boston 27—426 First St. • Chicago 3—79 West Monroe St.
Cleveland 14—616 St. Clair Ave. • Houston 2—1213 Capitol Ave.
Los Angeles 33—520 Anderson St. • Miami 34—2103 Le Jeune Rd.
New York 7—50 Church St. • Pittsburgh 19—437 Grant St.
San Francisco 11—420 Market St.
St. Louis 4—1450 South Second St.
Tulsa—1640 E. 21st St.

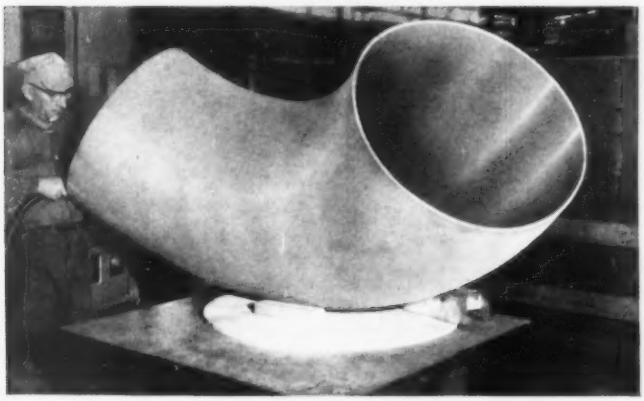
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES



Note the exceptionally long tangent on one end of this 36" O.D. 90° short radius elbow made of special carbon steel. Similar tangent could have been provided on other end if required.



18" O.D. x 1¼" wall 90° elbows (2¼% chrome ½% moly) being sized in compression by totally enclosing dies. The exceptional dimensional accuracy that results is possible only with the Midwest process.



Interior surface of 30" O.D. stainless steel welding elbow for liquid sodium nuclear system required a finish of 125 micro-inches or better.

8060

MIDWEST WELDING FITTINGS

IMPROVE PIPING DESIGN and REDUCE COSTS

along this line but pointed out that they did not concentrate on the special aspects of private practice.

Ethics and Practice

Ralph Westcott reported on ethics and policing procedure. He pointed to Section 9 of the bylaws which provides for disciplinary action, requiring five members to prefer charges for expulsion against any member upon the grounds of unprofessional conduct. He said that it is unlikely that charges of such severity will be preferred, but there are many grey area problems which should be brought to the attention of the ethical practice committee for discussion with the member involved. From investigations of complaints, a casebook of specific situations can be built up as a guide for all members. CEC now is working on this problem.

J. G. Wright commented on the enforcement of the Engineers' Act. Only in the civil engineering branch has there been enforcement except in connection with the illegal use of the titles. Steve Barnes pointed to the difficulty of getting a jury conviction. The question of incompetence also presents difficulties. The California Legislative Council of Professional Engineers has offered to assign members to assist in hearings.

Captain Flaherty, secretary of the Registration Board, reviewed several cases of incompetency, but he pointed out that the Board can only take action on legal and not unethical practices. Several cases have developed where a so-called engineering corporation has been set up by one who is not an engineer, the corporation then hiring a registered engineer to put his signature on drawings. This is a case of "aiding and abetting" and action can best be taken against the registered engineer. Bill Moore suggested the possibility of tightening the Engineers' Act by including the injunctive procedure.

Insurance

Vernon Smoots introduced Lee Hindenach, of Scott & Hindenach, who explained the operation of the CEAC group insurance program. The plan now includes 48 firms with 390 employees and 264 dependents insured. A dividend of $8470 was allotted to the plan for 1958, but due to heavy medical claims, all of the dividend actually was earned by the Life and AD&D coverages. There were no death claims during the year.

Richard Narver discussed professional liability insurance, reporting that as a result of favorable experience, rates for E&O insurance have dropped. He suggested in joint ventures that the name of the insured participating should appear in the policy. In city work under "hold-harmless" clauses, it is urgent that coverage be secured. A ruling by the courts that architects and engineers may be held liable for the life of the structure has added

KUNKLE

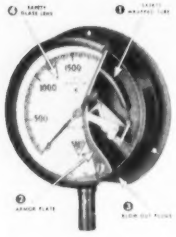
PRESSURE • VACUUM • COMPOUND

GAUGES

FOR PROCESS AND POWER INSTRUMENTATION

CATALOG DATA

Kunkle's new catalog is designed for use by specifying engineers, making it an easier task to select the right gauge at all times.



HIGH-RELIABILITY "SPECIAL PURPOSE" GAUGES

Gauges such as the safety case type, (see cut at left) . . . or beryllium, copper or Monel tube gauges . . . and 2½" stainless steel gauges are examples of Kunkle's ability to meet unusual pressure, corrosion resistance or capacity requirements.

From 15 p.s.i., or 30" of vacuum, to 20,000 p.s.i. Bronze, drawn or bored stainless steel, and other alloys.

KUNKLE

Kunkle Premier Gauges are guaranteed accurate within ½ of 1% of their maximum graduation. Backed by 50 years of experience in process and power instrumentation.

KUNKLE VALVE CO., 121 So. Clinton, Ft. Wayne, Ind.

ENGINEERING DATA • SELECTION INDEX

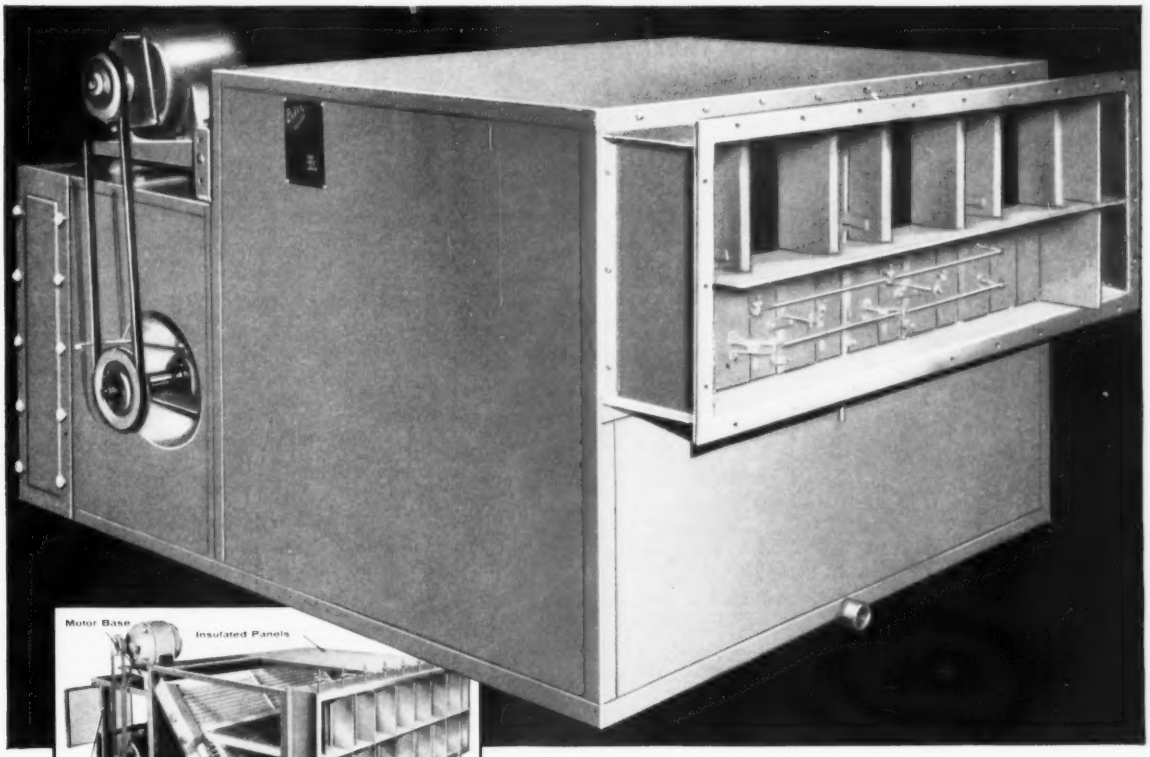
Gentlemen: Please Rush 1959 Gauge Catalog to . . . DATE

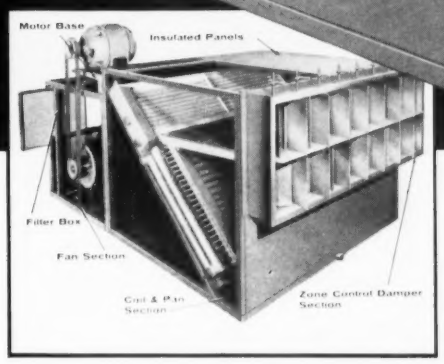
NAME

COMPANY

ADDRESS

CITY ZONE STATE





ACCURATE TEMPERATURE CONTROL PROVIDED BY "BUFFALO" ZONE CONTROL CABINETS

"Buffalo" Zone Control Cabinets are engineered for installations where a single unit must provide varying degrees of conditioned air for several zones or rooms. These quiet operating compact units perform with peak economy, flexibility and dependability.

Temperature is controlled by mixing cooled and heated air in just the right proportions to suit each conditioned space. The need for separate re-heat coils and their controls is completely eliminated. Control for each area can be manual or entirely automatic.

"Buffalo" Zone Control Cabinets are sectionalized for maximum ease of installation. Removable panels and bearings located outside the cabinet simplify servicing. The entire unit is sturdily constructed to insure a long life of maintenance-free operation.

You're sure of satisfactory results when you specify "Buffalo" Zone Control Cabinets. Your "Buffalo" engineering representative will be pleased to provide you with information concerning unit selection, installation, etc. Contact him, or write us direct for Bulletin AC-220.

All "Buffalo" equipment brings you the "Q" Factor — the built-in QUALITY which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY
BUFFALO, NEW YORK

Buffalo Pumps Division • Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING
FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

another hazard to professional people even after retirement.

Professional Divisions

Dudley Deane introduced the subject of professional divisions within CEAC. This move in part grew out of a report of the California Council, AIA, which was critical of electrical and mechanical consultants in the San Francisco area. The divisions, or groups, will include both nonmembers and members of CEAC, but will be operated within the framework of the association. Forty-five consultants were invited to attend the first meeting. It is hoped to achieve a better understanding with the architects, organize groups to study complaints, maintain minimum standards, and support joint council activity with the architects.

Foster Sampson said that such a group of electrical engineers had been meeting monthly in Los Angeles to discuss mutual problems and had been very effective.

Engineering Fees

Sheldon Swickard reported on progress in establishing more equitable electrical engineering fees. He reported a tendency by owners and some public bodies to insist upon lower fees. He said there should be a clear agreement with the client as to the fee basis. Better knowledge of costs, standardization of services through the Architect-Engineer conference, and provisions for supervision and policing of performance are essential, he said.

Wallace Donley led the discussion on progress payments for services. He said that payment schedules are out of date. Large lump sums, he pointed out, may result in heavy income tax payments. Peter Serrell said his firm arranges for payments to be made every 30 days based on the progress of work.

Foster Sampson brought up the question of making a profit on a 4 percent fee for electrical engineering in San Francisco when the fee in Los Angeles is 5 percent. Dudley Deane did not think the percentage fee is a good basis on which to conduct profitable operations. J. G. Wright said that military fee payments are generally lump sums with 10 to 14 percent profit mark-up which is not adequate. He said the use of man-hours as a fee basis should be discouraged.

New Officers

Officers elected for 1959 are: president, John A. Blume, San Francisco; vice president, Frank E. Alderman, South Pasadena; and secretary-treasurer, Arch McDougald, Fresno. New directors are: Frank E. Alderman and Wm. F. Ropp, Los Angeles; Bertram Goodenough, Sacramento; Peter Serrell, Los Angeles; and Dudley Deane, San Francisco. Holdover directors are John Blume, John Gould, Richard Kennedy, San Francisco; Arch McDougald, Fresno; and Sheldon W. Swickard, Los Angeles. ▲▲

Are you wasting all kinds of time selecting the right wire and cable for your job?

MEET THE MAN WHO CAN HELP YOU...

. . . on page 32

KERRIGAN *Weldforged* **ALUMINUM Pressure-Locked GRATING**

OPEN FLOORING AND TREADS
Welded, Riveted, Pressure & Roll-locked in steel, stainless and aluminum

CUT-OUTS
for Pipes—Columns—Machinery, etc.
to your Specifications

SAFE
one piece units easily installed. Maximum light and ventilation. Low maintenance costs. Send for free catalog.

Address: Dept. C-3

KERRIGAN IRON WORKS INC. - NASHVILLE, TENNESSEE

facts about Superior Packaged Boilers

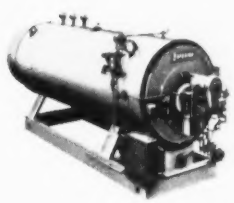
SUPERIOR'S MID-SHELL FURNACE LOCATION

protects against the two most common causes of furnace failure

One of the often overlooked, and yet very important considerations for the purchaser or specifier of boilers of the horizontal fire-tube type is the location of the furnace in relation to the boiler shell. To a great extent this location is determined by whether the boiler is of the up-draft or down-draft type. Up-draft units usually have the furnace set low inside the shell. Down-draft units usually have a higher furnace location.

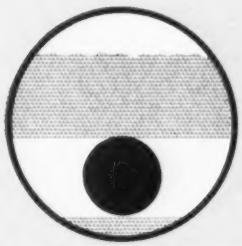
Ideally the furnace is located near the center of the shell, where it is protected from the two most common dangers which can cause bagging, blistering or complete burnout of the furnace.

The first of these dangers is low-water. When the furnace is located too high in the shell, the covering layer of water is necessarily less, and the danger is increased. When the furnace is too low within the shell, mud and silt can deposit on the bottom of the shell and eventually bridge to the bottom of the furnace, cutting off circulation and causing a burnout of the furnace. The adjacent diagrams show the location of the furnace in other fire-tube boilers and in Superior Type C boilers. When you buy or specify a packaged fire-tube boiler consider this important fact.

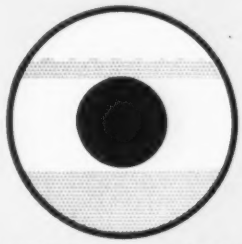


SUPERIOR "TYPE C"
PACKAGED BOILERS

Completely packaged fire-tube units for capacities from 20 to 350 bhp. Rotary burners on all sizes. Induced draft for clean, quiet safe operation. Fully insulated and ready for service burning oil, gas or both in combination. Pressures to 250 psi, or for hot water operation. Other fire-tube models for capacities to 600 bhp. Write today for Bulletin 13C.



LOW FURNACE...MUD BURNOUT DANGER



HIGH FURNACE...LOW WATER BURNOUT DANGER

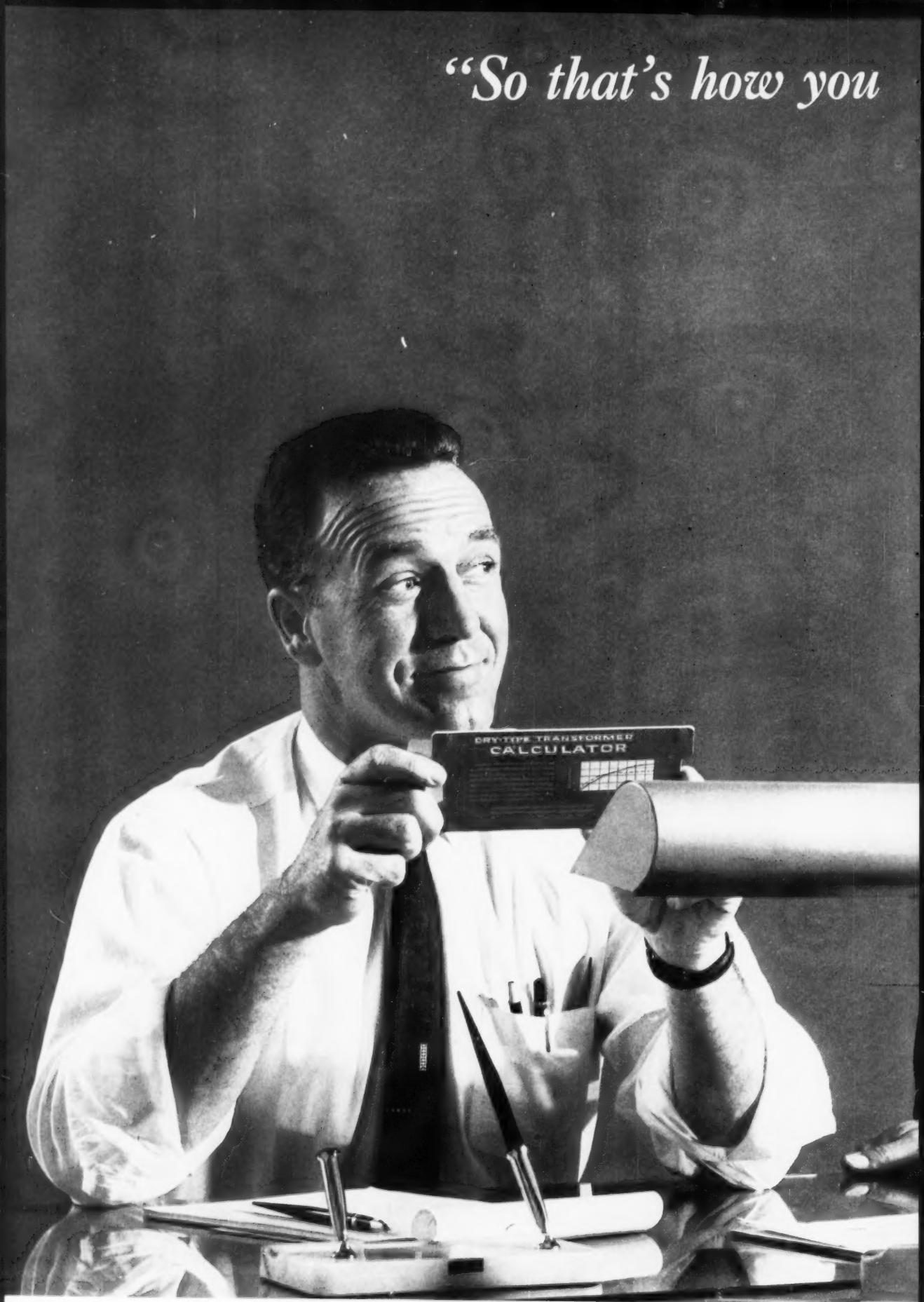
MID-SHELL LOCATION GUARDS AGAINST BOTH

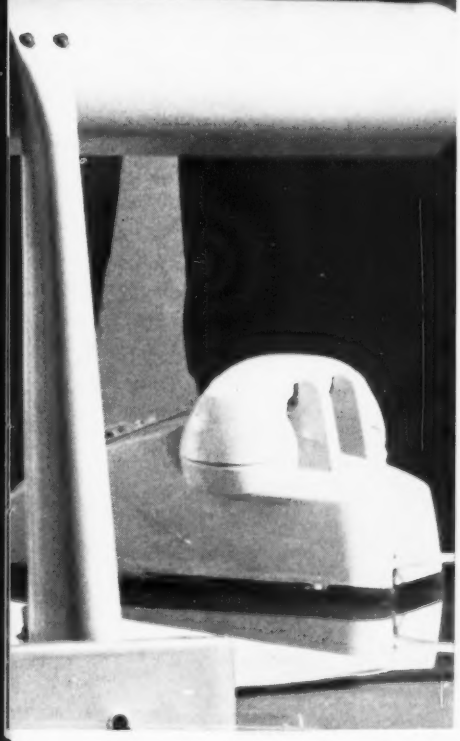
Specialists in PACKAGED BOILERS... exclusively

SUPERIOR COMBUSTION INDUSTRIES, INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
PACKAGED BOILERS

"So that's how you





dry-types so fast!"

General Electric's handy new calculator simplifies and speeds selection of new G-E Qr* dry-type transformers

This new calculator and the new Specifiers Guide make it easy to specify General Electric's new complete line of dry-type transformers. The calculator includes ratings, tap arrangements, dimensions, weights, sound levels, insulation, temperature rise, and types of mountings and connections. The Specifiers Guide, a buying manual, has complete information including descriptions, prices and details describing where and how to use dry-type transformers.

And you'll *know* you're specifying customer satisfaction when you specify General Electric QHT dry types. Here's why:

General Electric's transformers, from ½ to 500 kva, have a completely new type of silicone impregnated insulation, highly moisture resistant, with an inherent ability to withstand high operating temperatures. This improved insulation means long life and reliable service.

The new units are up to 15 decibels quieter with sound levels equal to or less than NEMA standards. One-piece frames and welded core clamps help eliminate lamination vibration for the life of the units. Transformers above 25 kva "float on rubber," practically eliminating noise transmission through mounting brackets and conduit to adjacent areas.

So, for customer satisfaction specify General Electric QHT dry-types, and, if you haven't received your copy of the new selector guide, just mail the coupon; we'll send it to you by return mail. Section 412-10, General Electric Co., Schenectady 5, New York.

*Quiet, High Temperature dry-type transformers.

GENERAL ELECTRIC

SECTION A 412-10
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK

Send for this new bulletin before you specify another dry-type transformer.

Please send me the new Specifiers Guide, GEA-6907, plus the new specifiers slide-rule calculator, GEN-181.

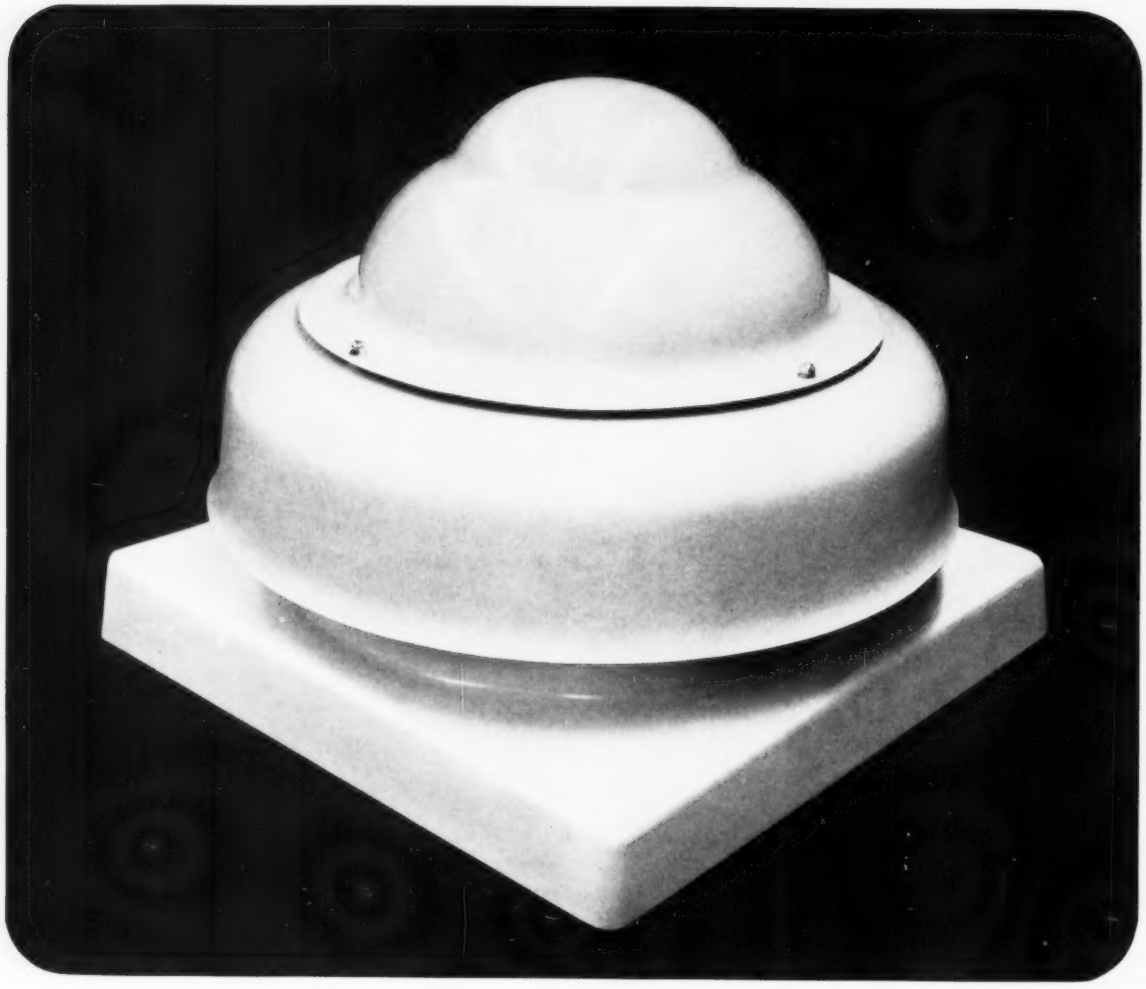
NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ **ZONE** _____ **STATE** _____



Introducing the all new "FIBER-AIRE" by Swartwout

All Fiberglas* Housing
Super Quiet
Indestructible
High Efficiency

- Fiber-Aire's all Fiberglas* housing actually **absorbs** noise and vibration . . . sets a new standard for ventilator quietness.
- Bonded Fiberglas* housing is virtually impossible to dent, crack or break . . . unaffected by salt spray, weather, fumes and most chemicals.
- Low contour and molded-in sky blue color enhance building design . . . Fiber-Aire never needs painting.
- Stainless steel air flow guides eliminate internal air shocks . . . increase efficiency . . . cut vibration.
- High efficiency throat and outlet minimize loss from friction and turbulence.

Fiber-Aire units are now available for immediate delivery in 21 direct and belt drive models with capacities from 180 to 4,000 CFM.

You'll get the complete story on the fabulous new Fiber-Aire ventilators in Swartwout's free bulletin "FA-1". Write now.

The Swartwout Co.
Ventilation Engineering
18571 Euclid Avenue — Cleveland 12, Ohio

* TM Owens Corning Fiberglas Corporation

In Canada: Eastern Steel Products Ltd., 8 Bermondsey Road, Toronto, Ontario

CITY ZONE STATE

New Emphasis on Ion Exchangers In Paper Making

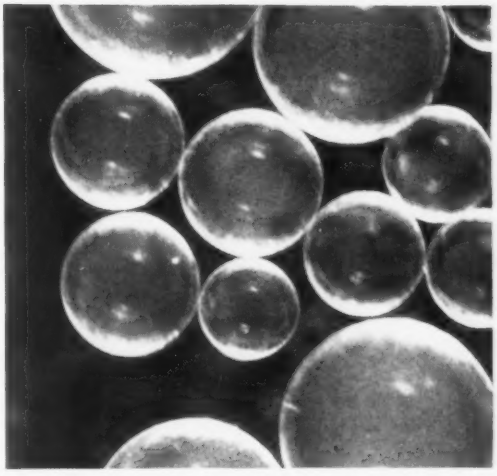
New *Nalcite* resins broaden water treatment scope; make demineralized water practical in wider range of paper mill applications

Bringing ion exchange—and especially demineralization—within the practical range of paper mill water treatment cost, handling and volume requirements is the job now being done with Nalcite Ion Exchange Resins for conditioning a variety of mill waters. Their practicality for these jobs is putting new emphasis on demineralization for producing high quality water at reasonable cost.

New Nalcite resins are new only in that they have recently been released for industry-wide use.

Nalcite HCR-W . . . pretested for four years . . . is a proven cation exchanger of superior physical stability, and is the latest addition to the series of high performance Nalcite resins.

Nalcite SBR-P . . . in slightly more than 3 years since its introduction this highly porous, strong base anion exchanger has surpassed performance expectations.



Nalcite HCR-W under the photomicroscope looks like no other ion exchange resin: clear, perfectly-formed microspheres, stress-free, crack-free, virtually breakage proof in any known ion exchanger service.

Better Water = Better Paper

Demineralized water for *process chemicals preparation* provides a solid base for making uniform solutions which will perform predictably. Other important examples are *aqueous coating solutions* and *dilution water for making electrical condenser paper*. Nalcite-demineralized water, having extremely high electrical resistance, goes far toward helping produce the dielectric strength in finished condenser paper that users want, but not always have been able to obtain.

Steam Production

Demineralized boiler feedwater solves a multitude of steam generation operating and maintenance problems at once. Use of Nalcite Ion Exchangers in modern demineralizing equipment is the surest source of top quality feedwater . . . water that helps produce steam at lowest possible cost.

Higher Physical Stability is Key To New High in Performance

Nalcite HCR-W cation exchanger is teamed with Nalcite SBR-P anion exchanger for top demineralizer performance—in either multiple bed or mixed bed systems. Stress relieved HCR-W bead microspheres are virtually shatterproof. Similar stability of SBR-P assures low pressure losses—and pressure drop stays at design figures since there are no fines to fill spaces between beads or clog strainers, distributors or controls. Backwashing and regeneration are quicker, more efficient with Nalcite exchanger beds.

New Ion Exchange Text Available

Full description and discussion of the many methods of modern ion exchange utilization is contained in Nalcite Bulletin Z-5. Bulletin Z-7 describes new HCR-W. Write for your copies now.

NATIONAL ALUMINATE CORPORATION

6180 West 66th Place Chicago 38, Illinois

Subsidiaries in Venezuela, Italy, Spain and West Germany
In Canada—Alchem Limited, Burlington, Ontario

nalco® ...Serving Industry through Practical Applied Science

Nalco Chemicals
Nalcite Resins

Kalamazoo
offers 3 bulletins to help you plan STORAGE BINS, TANKS, CHESTS for Bulk Materials in Process or Storage

1

Shows cross sections and details of Kalamazoo Industrial Storage Bin construction plus advantages of maintenance-free Kalamazoo Vitrified Glazed Tile. Application photos.

2

Eight pages describing round and rectangular Wood Tanks, Special Vats, Flumes, Ducts and Frost-Proof Wood Boxing, used in processing and bulk storage. Construction details, numerous examples.

3

Illustrates Kalamazoo Split Tile and Unit Tile for straight or curved tanks and chests. Also Tile Lining for old or new tanks, pits. Applications shown.

Fill out and mail coupon today.

CHECK BULLETINS YOU WANT—
Kalamazoo TANK AND SILO CO.
1058 Harrison Street
Kalamazoo, Michigan, Phone 5-2141

☐ 1—Tile Storage Bins, Bul. 1153-B
☐ 2—Wood Tanks, Bul. 655-W
☐ 3—Tile Tanks, Chests, Bul. 1055-T

Name_____
Title_____
Firm_____
Street_____
City_____ Zone____ State_____

Kalamazoo | TANK & SILO CO.

Heard Around Headquarters

A RECENT Consulting Engineers Council report, based on questionnaires sent out to the membership, showed fees in some areas of Armed Forces projects to be hopelessly inadequate. Reaction in Washington, as reported to the CEC executive meeting in mid-February, was that fees could not be too bad, since large numbers of consulting engineers still are trying to get Armed Forces projects.

The CEC report, now being distributed to the membership, showed high losses by the consulting engineer in some areas of government work.

"In no category is the profit greater than many Consulting Engineers Council members consider necessary to properly perform responsible services," the report began. And in several categories, the "average profit" is a net loss.

On major design of buildings, 50 percent of the projects reported showed a net loss to the architect-engineer. "This fee is less than that required for similar civilian work, and the low margin of profit on this basis is evidently inadequate to make the project attractive to responsible architect-engineers."

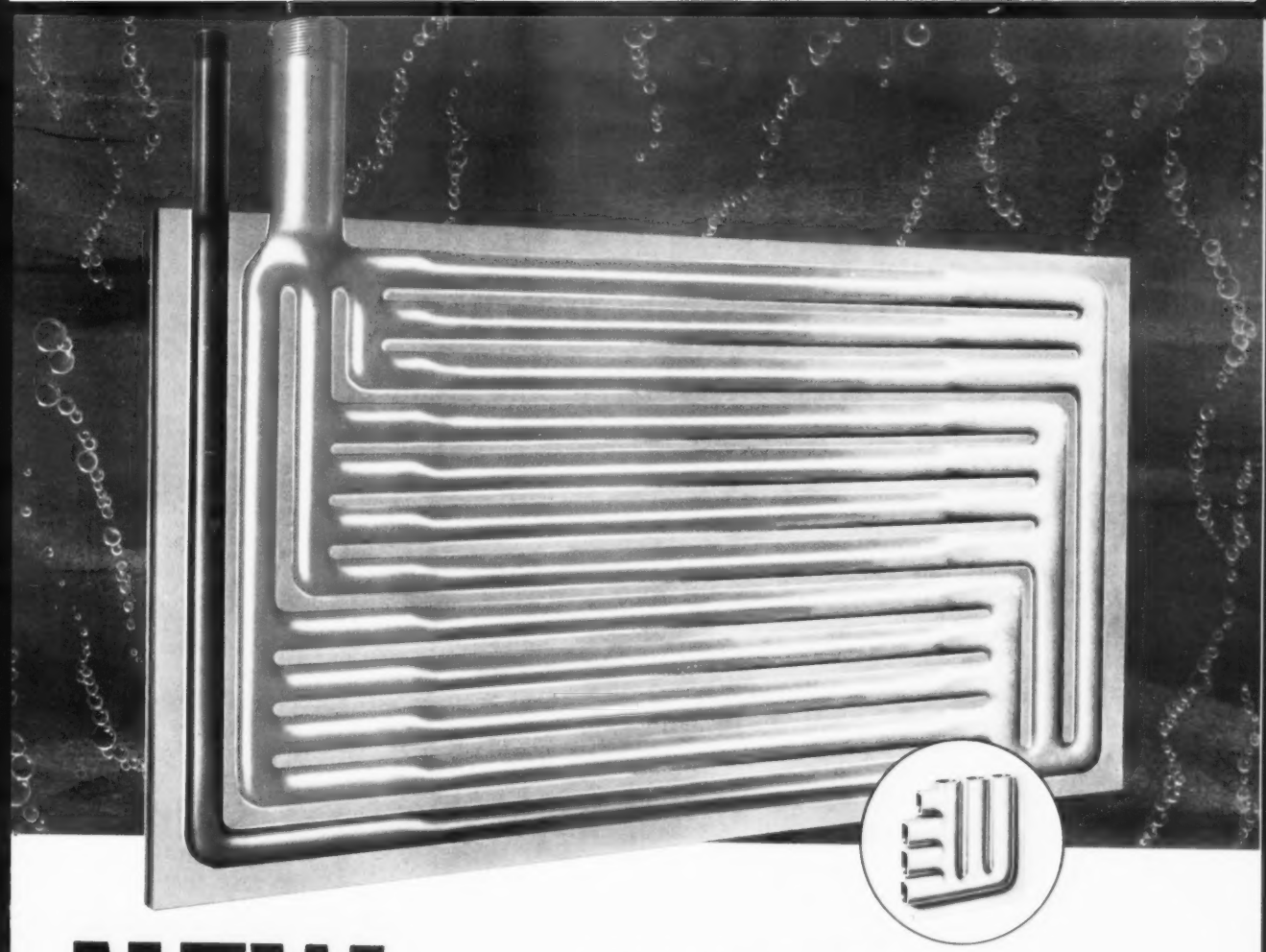
Consulting engineers working on a subcontract basis for other architect-engineers on government projects also fared badly. More than 34 percent of these projects showed a net loss.

Highest percentage of profit to the architect-engineer was shown for preliminary reports or advance planning, "yet many members consider this a minimum profit which must be earned to maintain an adequate staff and perform services of the quality required," the report went on to state.

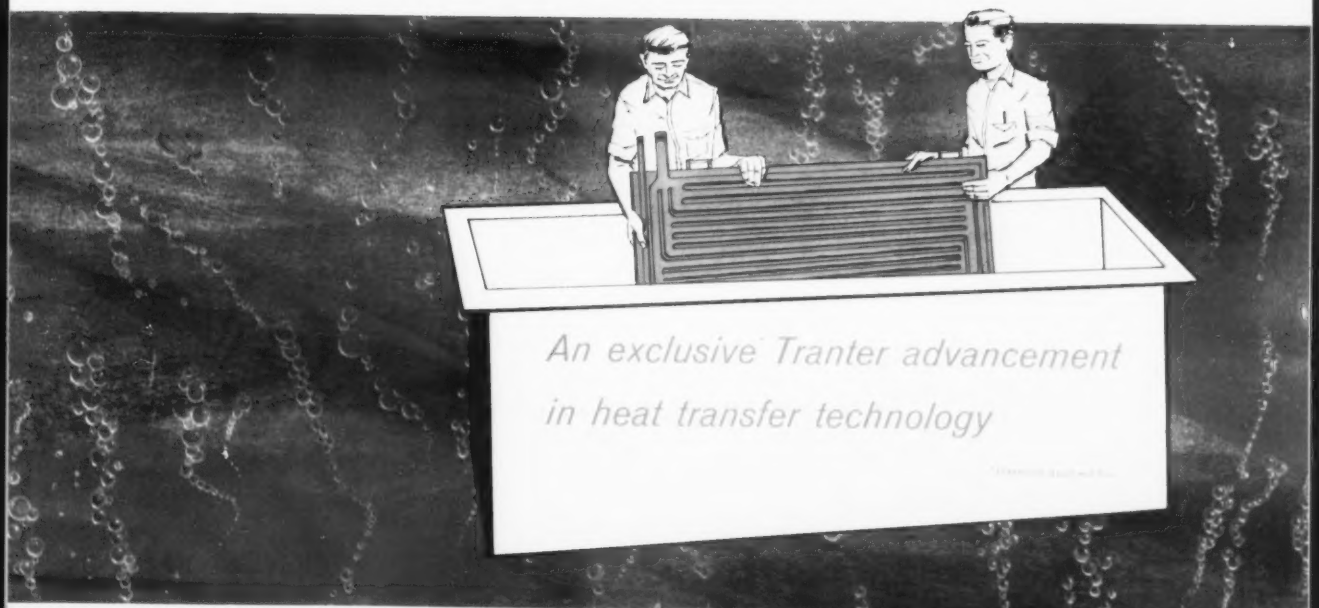
"Site adaptation of standard buildings is quite often represented as a project of a simple nature. The marginal profit reported indicates, however, that more work actually is required in site adaptation than was intended when building plans were standardized, or that possibly too much emphasis is placed on using standard buildings when they do not readily fit local conditions."

The Armed Forces have a six percent maximum fee, and supposedly allow a profit of 10 to 12 percent on average projects. Yet the analysis showed that even these low figures often are not reached.

Replies covered nine categories:
¶ Preliminary Reports or Advanced Planning – Average fee was 0.75 percent of total construction costs; overhead was 78 percent of the fee, profit 22 percent.
¶ Complete Services for Major Installations – Average fee was 2.06 percent of total construction costs;



NEW MULTI-ZONE PLATECOIL®



An exclusive Tranter advancement in heat transfer technology

NOW, more than ever, a complete range of heating and cooling applications is possible with PLATECOIL®

Higher pressure ratings

Now, the time-proven advantages of PLATECOIL over pipe coils can be applied to a new range of heating and cooling problems requiring operating pressures up to 250 p.s.i. Styles, sizes and metals are available to fit the requirements of all types of process tanks as well as waste heat recovery, oven and furnace, heat screen and similar applications.

Save on engineering, installation and maintenance

Factory-fabricated PLATECOIL is easy to engineer. Standard data on heat transfer capacities and performance characteristic of PLATECOIL eliminates time-consuming computation of pipe coil requirements. High BTU transfer per unit area as compared with pipe coils results in the use of less equipment by volume to save valuable tank space. Lightweight PLATECOIL units are easy to handle for fast, economical installation or removal for cleaning. Streamlined design tends to retard the build-up of deposits on the plates and makes cleaning an easy operation. Electric welded and pressure tested, PLATECOIL units have no threaded joints to corrode or leak. Simple connections can be located above the liquid level.

NOW OPERATING PRESSURES UP TO 250 PSI

Higher pressure containment is the result of design and construction refinements achieved exclusively by TRANTER. New TRANSTEEL mild steel in standard PLATECOIL units, DURAWELD bonding of plates, plus MULTI-ZONE coil configuration represent a new scope of PLATECOIL versatility and performance potential. Laboratory tests to destruction have demonstrated a safety factor of more than 5 to 1.

Get the facts now on new operating characteristics of the complete PLATECOIL line.

SEND FOR NEW PLATECOIL Bulletin No. P85

Tranter Manufacturing Inc.

LANSING 9, MICHIGAN

PLATECOIL® DIVISION

overhead of 95 percent; profit of 5 percent.

¶ Buildings and Related Facilities (Major Design) – Average fee was 4.3 percent of total construction costs; overhead of 96 percent; profit of 4 percent.

¶ Site Adaptation of Standard Buildings – Average fee was 1.6 percent of total construction costs; overhead of 97 percent; profit of 3 percent.

¶ Utilities, Paving (Streets, Roadways, Runways, Aprons, Taxiways, Etc.,) and Grading – Average fee of 3.56 percent of total construction costs; overhead of 75 percent; profit of 25 percent.

¶ Alterations, Conversions, Repairs, and Rehabilitation – Average fee of 3.8 percent of construction costs; overhead of 84 percent; profit of 16 percent.

¶ Dams, Locks, Waterfront Facilities, and Other Civilian Work of COE – Average fee of 2 percent of construction costs; overhead of 96 percent; profit of 4 percent.

¶ Subcontract for Other A-E – Average fee of 3.2 percent of construction costs; overhead of 106 percent; loss of 6 percent.

¶ Miscellaneous Engineering Services – Average fee of 3.74 percent; Overhead of 107 percent; loss of 7 percent.

"There is widespread disagreement with the profit basis allowed by the Corps of Engineers . . .," the report pointed out. "Most firms making such comments feel that the profit should be set up as approximately 25 to 30 percent of the total fee, depending upon all of the circumstances for a particular job, analogous to the profit which is expected on civilian work."

And, "Widespread reports are received from engineers that their overhead costs run from about 75 percent to as much as 125 percent of productive costs. This appears to be a very serious problem inasmuch as many of the agencies of the Armed Services will not recognize overhead costs of this magnitude. These comments have been

STRAN-STEEL BUILDINGS—NOW IN COLORS!

Stran-Steel Rigid Frame structures have no interior columns. From wall-to-wall and ceiling-to-floor their wide open interiors are 100% usable.

MODERN PLANT CONSTRUCTION AT ITS FINEST

Fashionable as well as functional, these all-steel buildings are available in six rich Stran-Satin Colors: blue, bronze, green, gray, rose and white. Factory-applied Stran-Satin Color coatings of vinyl-aluminum are baked on over zinc-coated steel.

Stran-Steel's rugged construction assures you of today's best all-around buy in industrial and commercial buildings. You specify the size and layout you want—custom-tailoring is a specialty with Stran-Steel. Only 25% initial investment and five years to pay on Stran-Steel's purchase plan. For full details, mail coupon or contact your Stran-Steel dealer. He's listed in the Yellow Pages under *Steel Buildings* or *Buildings—Steel.*

LOW-COST STRAN-MASTER: The fireside Stran-Master, lowest cost all-steel building, is also available in Stran-Satin Colors. Yours for only a few hundred dollars down.

Stran-Steel

DEALERS EVERYWHERE

Dept. CE-7
STRAN-STEEL CORPORATION
Detroit 29, Michigan • Division of
NATIONAL STEEL CORPORATION

Stran-Steel Corporation, Dept. CE-7
Detroit 29, Michigan

Please send data on Stran-Satin Color and complete literature on industrial buildings.

Name_____
Title_____ Phone_____
Company_____
Address_____
City_____ Zone____ State____

WITH **THOMPSON**
Servisafe **POLES**

Only five minutes required to replace burn-out on 30-foot pole!

Maintaining pole-mounted luminaires really is an easy job . . . with "Servisafe" Metal Poles. All work is accomplished at ground level with a "dead" fixture. As a result, one man can relamp and clean a luminaire with complete safety in any kind of weather. And the only "auxiliary" equipment required is a detachable handline!

Decorative as well as functional, "Servisafe" Poles feature unique advantages that assure peak lighting efficiency with minimum annual cost. Both single and double-arm models of steel or aluminum construction are available in heights up to 35 feet.

FOR SPECIFICATIONS AND PRICES, WRITE FOR BULLETIN PWB-59. 8310-TE

T-E

THE THOMPSON ELECTRIC CO.

P. O. Box 873-B • Cleveland 22, Ohio

received principally from large and medium sized firms whose overhead would not be expected to be unusually high."

Comments of consulting engineers, added to the information requested on the questionnaire, showed dissatisfaction with a number of other aspects of Armed Forces contracts:

¶ The 6 percent maximum fee allowed is too low.

¶ A number of unrelated jobs are grouped together, and a fee then is determined as though it were for a single project.

¶ Preliminary cost estimates furnished by the Armed Forces often are "grossly inadequate."

¶ Extensive alterations are required, but not provided for during fee negotiations.

¶ Practices of an agency vary from district to district.

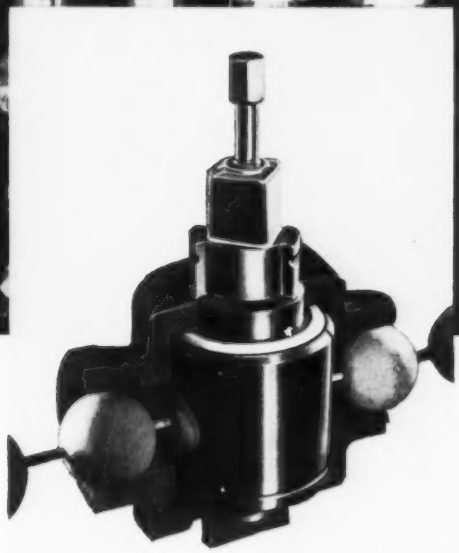
¶ Standard manuals furnished are inadequate, obsolete, or not applicable to the project.

Replies of Interest

At a recent Washington meeting with CEC delegates, replies to the report were presented from the Air Force, the U. S. Army Corps of Engineers, and the Bureau of Yards and Docks.

The Air Force reply consisted of a single-page letter which proposed that CEC should make constructive suggestions rather than merely point out the facts of the fee situation as they presently apply. Although acknowledging that certain Air Force practices are unfair in individual cases, the final comment of the letter was that architects and engineers still are busily soliciting Air Force work, so the fee situation could not be too bad.

The Bureau of Yards and Docks reply indicated that the Bureau could not agree with CEC's contention that many architect-engineers do not want its work. On the contrary, the Bureau is beseiged by architect-engineers looking for work. The letter added that nothing in the CEC analysis appears to war-



W-K-M's *Creative Engineering* has solved your plug valve problem!

Users of ACF Lubricated Plug Valves are enthusiastic about the performance of their valves.

Whatever the service . . . whether the valves are small or large . . . whatever the lading . . . ACF Lubricated Plug Valves handle the most difficult valve jobs.

For example: The shearing action of the cylindrical plug cuts through tough, stringy slurries clean as a knife—no stoppages, constant flow.

For example: You can see excess lubricant as it escapes around the neck of the plug—no build-up of excessive lubricant pressure; no lubricant forced into the line.

For example: Special design requires a minimum amount of lubricant for servicing.

For example: The valves may be installed in any position, and they fit into the smallest possible space.

Specify ACF when your job calls for plug valves. They'll give you dependable performance, long life and economical operation.

acf®

Lubricated Plug Valves

with round port, full pipe area

This is the valve for heavy fluids and ladings. When open, the round port becomes an exact continuation of the pipe. There is no change in velocity, area, direction or cross-section of the lading. There are no pockets to trap the lading, and seating surfaces are sealed away from contact with the fluid flow.

• • •

W-K-M provides a complete line of specially formulated lubricants for ACF Lubricated Plug Valves. Write for Catalog 800 for ACF lubricant recommendations.

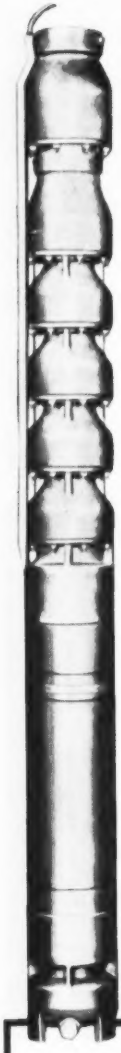
WRITE FOR CATALOG 400

W-K-M

DIVISION OF acf INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

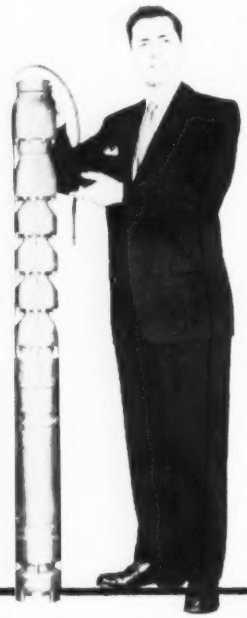
9022

Best way to meet large scale pumping requirements



For water supply, choose and specify Sumo Submersible Deep Well Pumps

These electrically operated, high capacity pumps are installed directly in the well, completely under water. The entire installation is fast, neat and compact. Sumo Submersibles have been used in installations all over the world. They're completely dependable and designed to operate at highest efficiencies. Sizes from 1/3 hp to 120 hp with capacities up to 1500 gpm.

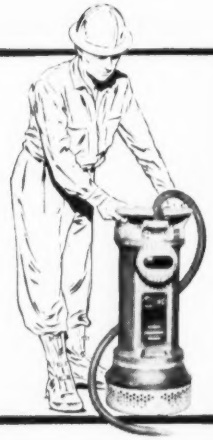


Engineering Assistance. Sumo's nationwide pumping experts are ready to assist you in problems of selection, application and installation. No obligation, of course.

BULLETIN B-1000 has complete details. Send for a copy.

For drainage, dewatering or flooding choose and specify Sumo Submersible Drainer Pumps These 7½ hp electric submersible drainer pumps are designed to pump water containing up to 20% solids. They're sturdy, reliable and can be used either as portable units or permanent installations. They're ideal for construction work, for dewatering mines, flooding compartments; pumping river or canal water.

BULLETIN B-1100 has details. Send for a copy.



SUMO PUMPS INC.

P.O. Box 983 Stamford, Conn.

Sales Representatives in Principal Cities

rant any changes by the Bureau of Yards and Docks in their current procedures, and that individual hardship cases should be taken up with the local District Public Works Officer concerned.

The Corps of Engineers reply was much the same – the Corps disagrees with the CEC contention that many architect-engineers do not want Corps projects. The Corps gets constant requests for projects from consulting engineers. No change in policy on the part of the Corps of Engineers is contemplated as a result of the questionnaire, and local hardship cases should be taken up with the District Engineers concerned.

It is not often that the Army, the Air Force, and the Navy can agree this completely, on anything, so CEC has accomplished something. The replies to the CEC report sounded like carbon copies of a single decision.

The CEC is now investigating means of putting up an equally united front to get something done about the low fees and high costs of working for the Armed Forces.

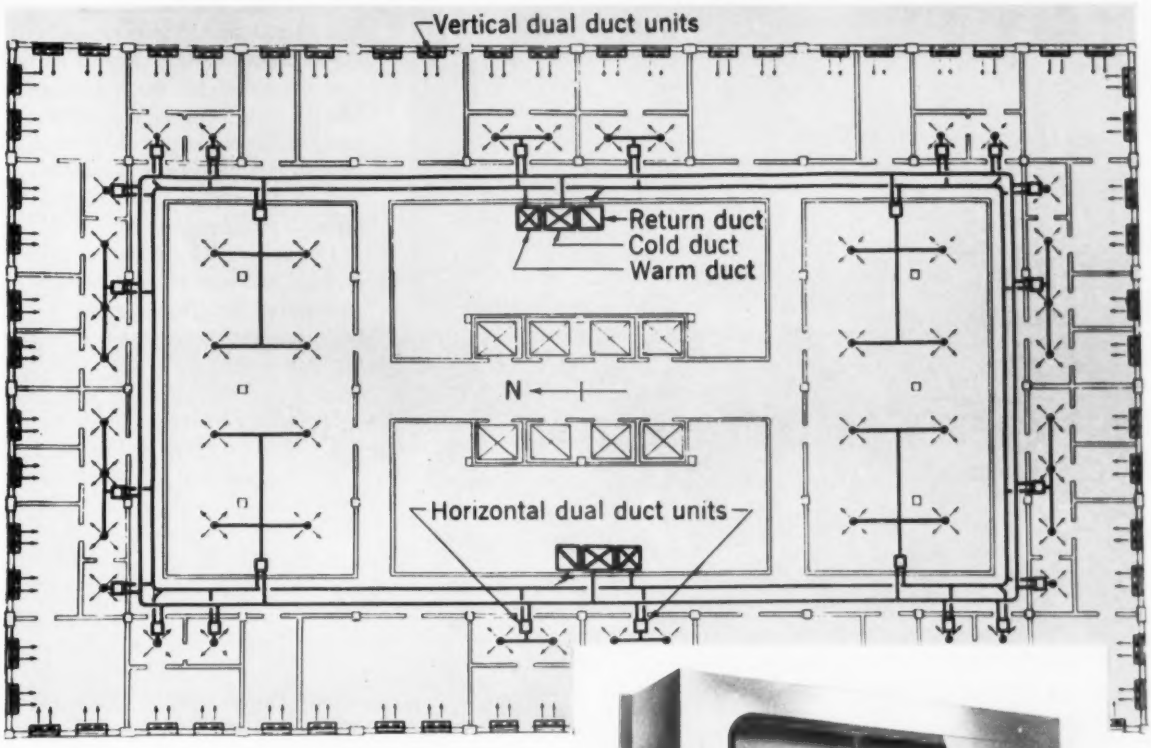
EJC Board Meeting

Engineers Joint Council and the Engineers Council for Professional Development are going full speed ahead to work out the details of consolidation. Already all available material has been circulated to EJC constituent organizations.

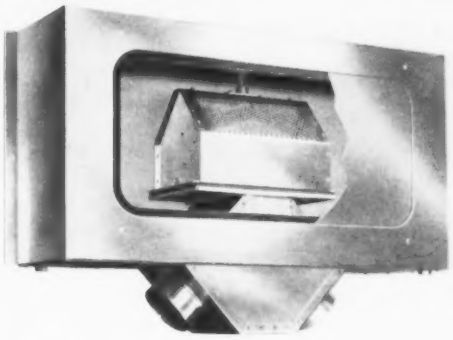
Everyone wants it understood from the beginning that the consolidation of EJC and ECPD has nothing to do with any of the proposed plans for unity. It would neither facilitate nor interfere with any of the currently popular unity plans of the Founder Societies.

One interesting problem to be solved is the finding of a name for the amalgamated group. Although it was referred to at the EJC board meeting as the "American Engineers Association," it was stressed that this was merely for a lack of anything else to call the new group. A committee was appointed to find

HOW TO "BALANCE A BUILDING" BEFORE IT'S BUILT:



Shown above is a typical office building dual duct layout, 100 per cent air system. It is zoned to provide selective temperature control for each enclosure with Buensod vertical dual duct units at exterior walls. These under-window units may be connected to vertical risers, or to horizontal mains at the ceiling or on the floor below.



Illustrated: Buensod Type V window-wall unit with cut-away showing automatic volume control. This unit is designed for installation under windows to discharge vertically upward, quietly and without draft.

Balancing a building before it's built . . . almost an incongruity, yet Buensod does it consistently. Buensod air mixing units can be pre-set at the factory for desired volume and guaranteed within ±5% when installed. Whenever desired, a change in air volume may be made in the field by simple adjustment of one nut. This practically eliminates the tedious job of balancing after installation . . . a chore which can take months.

The secret is in Buensod's proven Automatic Volume Control. A simple tent-like apparatus maintains constant air quantity from each unit regardless of variance of static pressures on either inlet or outlet of mixing valve. This operates automatically . . . independent of any outside power source, sensing instrument or complicated linkage arrangement. The mixing valve is actuated by a local thermostat to provide the desired room temperature.

Buensod units are being designed into a constantly increasing number of new and renovated structures. Consider them for your next project.

BUENSOD DUAL-DUCT

Write for details to: BUENSOD-STACEY INCORPORATED

Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York

St. Nicholas Hospital, Sheboygan, Wisconsin

KOHLER ELECTRIC PLANTS

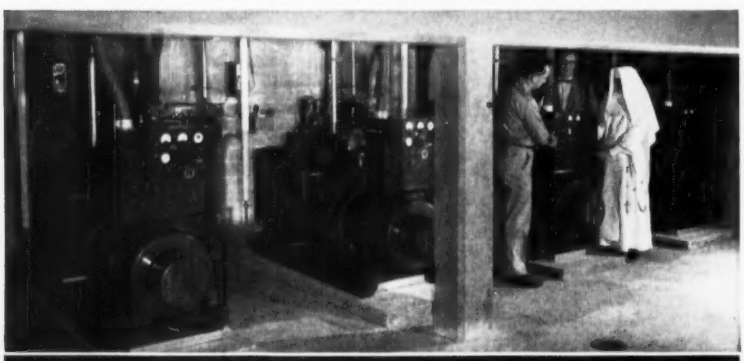
provide protection against power interruptions through 34 years' growth

In 1925, two 1500-watt Kohler Electric Plants were installed in St. Nicholas Hospital, Sheboygan, Wisconsin, as stand-by units to take over critical loads *automatically* when storms or other emergencies cut off regular electricity. Through the years the electric plant installation was expanded as new facilities were added by the hospital.

Today, in a building covering an entire city block, four 50 KW Kohler Electric Plants provide all the electricity needed for uninterrupted patients' care whenever normal power is cut off.

In hospitals everywhere, Kohler Electric Plants insure steady, reliable, unattended power for surgery and delivery rooms, and all other vital hospital facilities. Sizes to 100 KW, gasoline and diesel. Complete manual with suggested specifications sent on request. Write Dept. D-66.

• *Kohler installation with two 50R58, 50 KW, 230 volt, 3 phase AC models; and two 50R68, 50 KW, 115/230 volt, single phase AC models.*



KOHLER CO. Established 1873 KOHLER, WIS.

KOHLER OF KOHLER

Enameled Iron and Vitreous China Plumbing Fixtures • Brass Fittings
Electric Plants • Air-cooled Engines • Precision Controls

a nice broad title for an engineering organization.

Also at the board meeting, EJC President Enoch R. Needles pointed out that the consolidation of EJC and ECPD should strengthen both organizations. "There should be no loss of prestige for either Council." The two councils would work on parallel levels, and they would have the same duties, limitations, and responsibilities as they did prior to the merger.

The new EJC charter is broad enough to cover the expanded organization. Now some of the questions remaining to be solved are tax status (the wrong status could keep EJC-ECPD out of the new engineering headquarters); membership provisions; deciding what is needed in the way of executive personnel and administration; and — of course — financing.

An interim report was received from the planning committee. This report, prepared at the request of Needles, was a summation of opinions expressed by constituent societies regarding EJC's role.

Basic recommendations of most of the societies reporting were:

¶ More active or more extensive promulgation of the views on the engineering profession on public policies in both national and international affairs.

¶ Development of a far more effective two-way communication between the Council and all engineering organizations in the country.

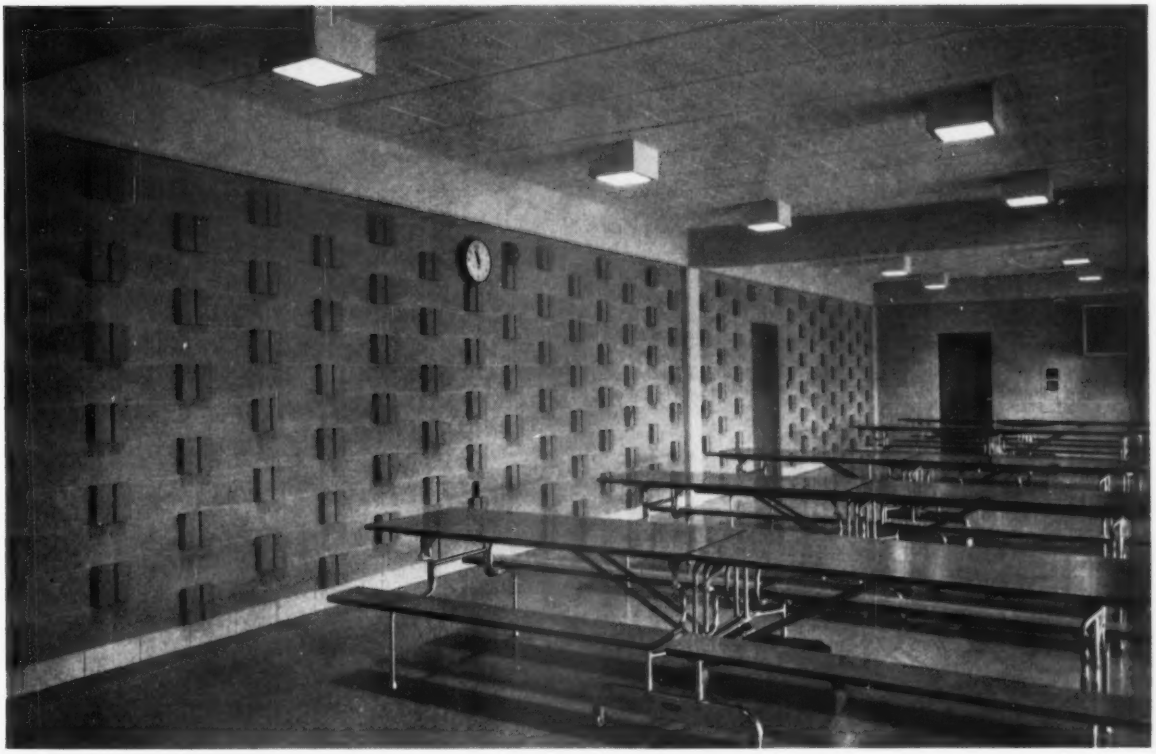
¶ Seeking of maximum public recognition of engineering achievements by proper use of all available media for communication.

¶ Increased financial support of EJC to permit maximum implementation of its program for the benefit of the engineering profession.

In line with these recommendations, the EJC board voted to supplement its advertising budget with a campaign aimed at writers and editors of the news. Objective of this program would be the elimination of such things as recent New York newspaper headlines stating

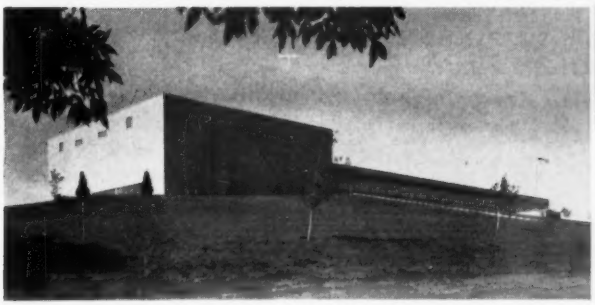
DUR-O-WAL® SAFEGUARDS THE BEAUTY OF MASONRY CONSTRUCTION

Throughout the United States genuine Dur-O-waL Steel Reinforcing is being used in the mortar bed to provide lasting protection for the classic beauty of masonry construction



You can provide timeless protection for the flawless beauty of masonry with time-tested Dur-O-waL. This high-tensile steel re-inforcing is trussed designed and custom fabricated to give masonry walls a backbone of steel.

Specifications and Research data available on request.



DUR-O-WAL®
Rigid Backbone of Steel For Every Masonry Wall

Dur-O-waL Div., Cedar Rapids Block Co., **CEDAR RAPIDS, IA.** Dur-O-waL Prod., Inc., Box 628, **SYRACUSE, N. Y.** Dur-O-waL Div., Frontier Mfg. Co., Box 49, **PHOENIX, ARIZ.** Dur-O-waL Prod., Inc., 4500 E. Lombard St., **BALTIMORE, MD.** Dur-O-waL of Ill., 119 N. River St., **AURORA, ILL.** Dur-O-waL Prod. of Ala., Inc., Box 5446, **BIRMINGHAM, ALA.** Dur-O-waL of Colorado, 29th and Court St., **PUEBLO, COLORADO** Dur-O-waL Inc., 165 Utah Street, **TOLEDO, OHIO**

—"Engineers Go Out on Strike." (What the story meant was that the local janitors were unhappy.)

Financing of the advertising program would be supported by funds from the constituent societies, the amounts given being voluntary.

Now It's ASHRAE

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers has received its articles of incorporation, and the former American Society of Heating and Air-Conditioning Engineers and the American Society of Refrigeration Engineers now formally are one. The incorporation was received in early February, shortly after the 65th, and last, annual convention of ASHAE.

The new group will maintain two New York City offices during the transition period, which is expected to last about two years. Another change takes place early this month. *Refrigerating Engineering*, formerly the official book of ASRE, will become the *ASHRAE Journal*.

The new organization, which must operate for one year before it can apply for a tax classification, plans to be a charter tenant of the new Engineering Headquarters.

Keough-Simpson Bill

On the opening day of the 86th Congress this year, bills providing for retirement plans for the self-employed were reintroduced.

These bills, HR9 and HR10, are almost identical to the Jenkins-Keough bill, which passed the House but failed to get through the Senate last year. The new legislation is known as the Keough-Simpson bill.

NSPE again is requesting that consulting engineers send contributions to assist the American Thrift Society in its fight for the self-retirement plans. The Thrift Society is receiving funds for the legislative battle from a number of professions, including engineers, physicians, attorneys, and dentists.

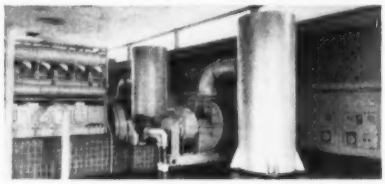
Consulting engineers also are requested to write their congressmen supporting the bill.

From Consulting Groups

MARYLAND—At the annual meeting of the Consulting Engineers Council of Maryland Inc., William G. Robertson, Jr., of Henry Adams Inc., was elected president.

Other new officers are Paul G. Crout, of Crout, Snyder & Crandall, vice president; Henry A. Naylor, Jr., of Whitman, Requardt & Associates, secretary; and Curt A. H. Jeschke, of Purdum & Jeschke, treasurer.

Among the current projects of the Maryland Council is a "Schedule of Recommended Minimum Fees," compiled to represent the minimum fee, below which competent and responsible engineering service cannot be rendered. "The Manual is intended to be of service not only to consulting engineers but also to clients in providing the



SEWAGE PLANT COMPRESSORS

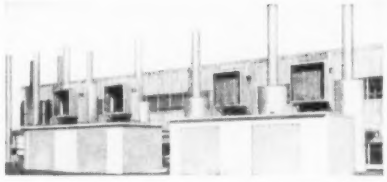
MAXIM

THE COMPLETE SOURCE OF

SILENCERS

For over 50 years, Maxim's main concern has been to engineer the finest silencing equipment possible. Maxim's complete line of silencers makes it possible to select precisely the kind and degree of noise control you need. Put Maxim engineers to work on your special problems, or send for latest bulletins.

MARINE ENGINES



POWER PLANTS

Emhart Manufacturing Company
Maxim Division
Hartford 1, Connecticut

EMHART

Emhart Manufacturing Company, Maxim Division
Hartford 1, Connecticut 80

Please send me bulletins on Maxim Silencers for:

☐ Waste heat recovery
☐ Steam, air or gas discharges
☐ Jet engine exhaust and intake
☐ Internal combustion exhaust and intake
☐ Air compressor intakes and discharges
☐ Blower intakes and discharges

name

company

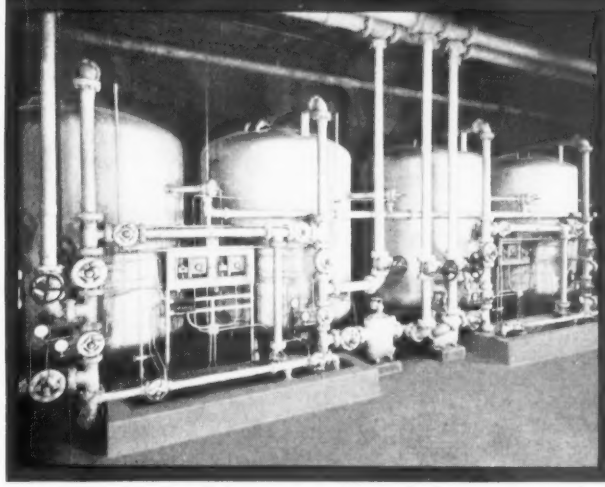
address

BRUNER Industrial WATER SOFTENERS

. . . are frequently SPECIFIED by leading engineers for important installations

This is Mayfair, Milwaukee, one of the largest shopping centers in America. One of Bruner's largest water softener installations softens all the water — even in the air conditioning system.

Hundreds of Bruner commercial and industrial installations throughout the United States and in many foreign countries are providing trouble-free service in both large and small applications. Water softeners, filters, and other Bruner water conditioning equipment are available for immediate delivery from stock in many types and sizes. Custom installations are fabricated to engineer's exact specifications.



The Bruner softeners at Mayfair are fully automatic. Salt storage and brining systems are specially designed. Softener capacity is 13,000,000 grains and delivers 1,750,000 gallons of softened water @ 1200 GPM.

Consulting Engineer: L. R. SCHMAUS CO., INC., Milwaukee, Wis.

Architect: GRASSOLD-JOHNSON & ASSOCIATES, Milwaukee, Wis.

Plumbing Contractor: SEDLET PLUMBING & HEATING, INC., Milwaukee, Wis.

Automatic Industrial type softener carried in stock.

BRUNER WATER SOFTENERS & FILTERS

BRUNER CORPORATION

America's most complete line of quality water softeners and filters.

Executive Offices: 4763 N. 32nd ST., MILWAUKEE 9, WIS.
Telephone: HIlltop 2-3200

Plants: Milwaukee, Wis., and Los Angeles, Calif. Sales and Engineering Offices in all principal cities.

information necessary to safeguard the interests of both. It sets forth the proper approach in obtaining professional engineering services, in establishing the fundamental structure for engineering agreements, and in establishing the general conditions that should apply to the conduct of engineering assignments under various types of agreements," the foreward states.

The Maryland Council, which currently has 28 members, is considering joining the Consulting Engineers Council. However, it was explained that the Maryland group wants to settle local organizational problems first.

One of the public service projects of the Maryland Council has been a program in cooperation with the Baltimore Buildings Committee. Council members take on small inspection jobs at committee request.

NEW YORK — A budget of $8900, excluding Consulting Engineers Council dues, was adopted by the New York Association of Consulting Engineers. Members are to be billed later for CEC dues, which CEC delegate John K. M. Pryke predicted would add $4000 to $5000. Last year, the combined Association and CEC dues for the New York City group was $9933.

The Association also adopted a new method of dues assessment. Formerly the dues ranged from $125 to $225. Under the revised system, the membership was divided into more groups with the range of $73 for firms of four technical employees or less to $255 for organizations of 100 or more technical employees.

The Association also voted to open its offices to high school and college students for tours held in cooperation with Engineers Week.

Others cooperating with the New York State Society of Professional Engineers on the program to give students a view of engineers in their natural habitats were municipal departments, public utilities, manufacturers, and contractors.

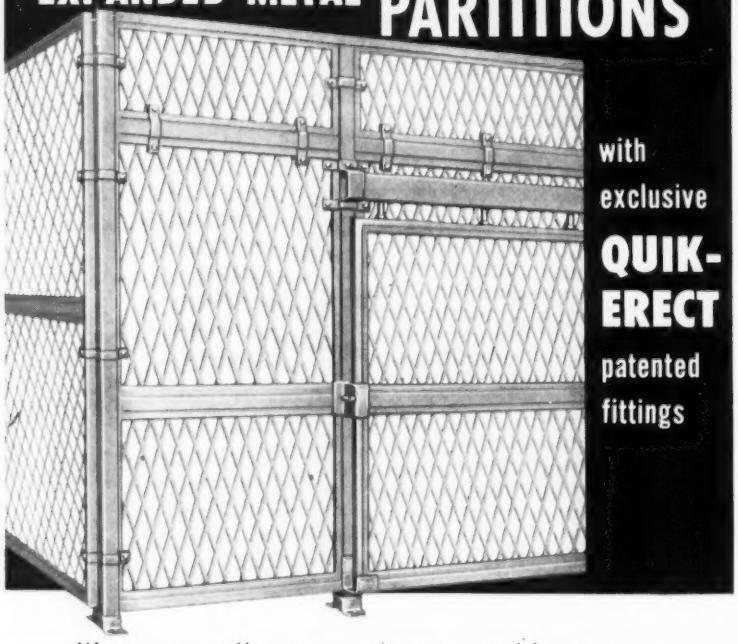
NEW YORK STATE — A proposed fee schedule has been presented to members. Suggested revisions will be made in the first draft, and the schedule resubmitted to the Board of Directors at its April 4th meeting in Buffalo. As the *Empire Engineer* pointed out, "after years of talking we now are making real progress."

At the Western New York Chapter meeting, it was announced that a brochure describing the function of the consulting engineer will be ready for circulation soon.

The Long Island Chapter, scheduled host of the annual State Association meeting to be held in June, could not get a state officer to the meeting because of the airlines strike, so officers were installed via long distance telephone.

The Long Island officers were installed by Cedric Acheson, CEC delegate. They are Julius Schubert, president; Robert Holzmacher, vice president; Horace McAllister, secretary; Edwin Metcalf, treasurer.

GLOBE... SAFE•GARD
(FORMERLY HILMAR)
EXPANDED METAL PARTITIONS

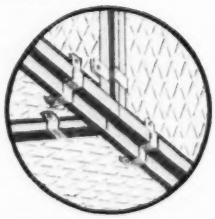


with exclusive QUIK-ERECT patented fittings

...will answer all your enclosure problems...

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

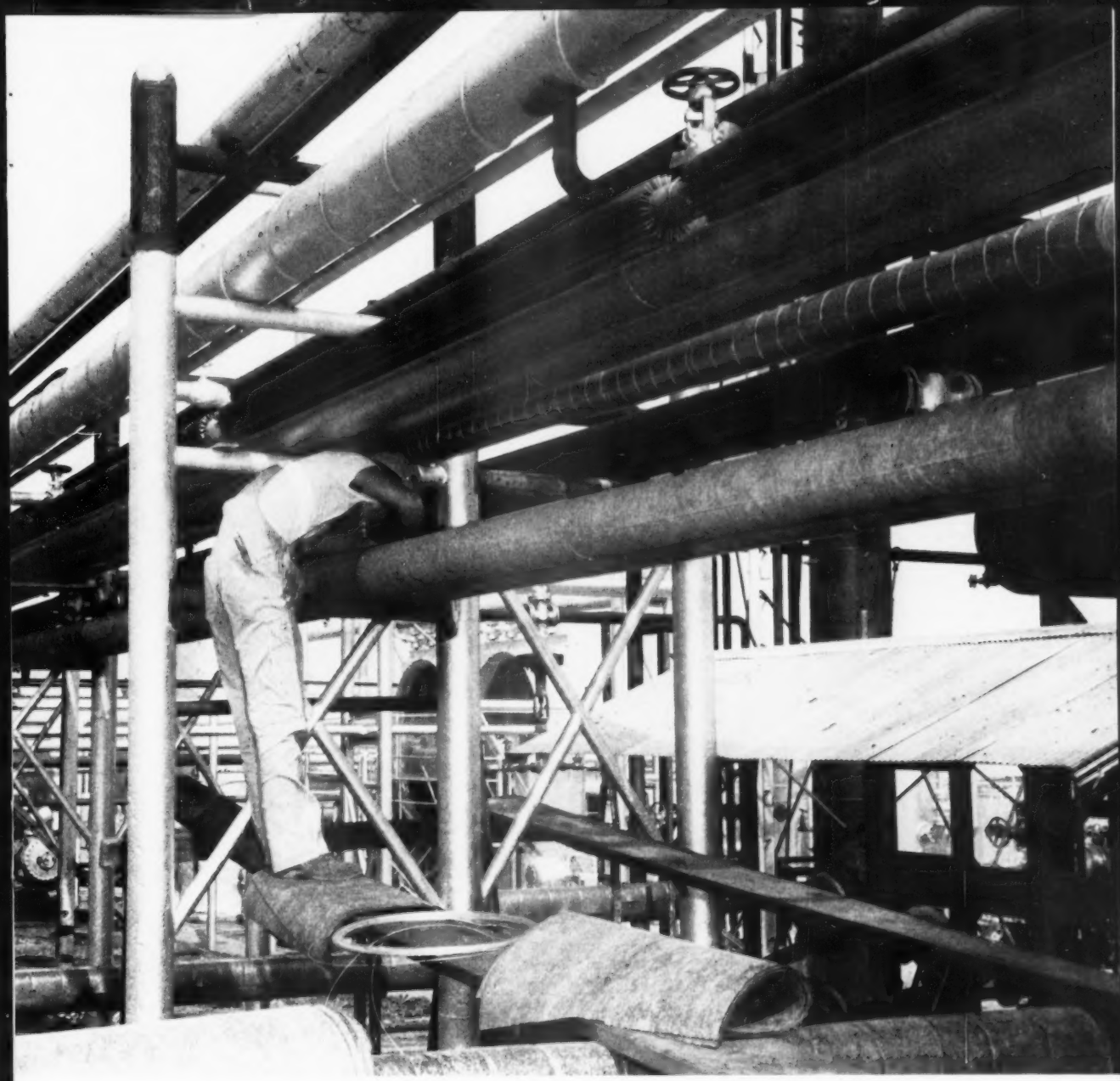
EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe•Gard panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE•GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor. Distributors in all principal cities, listed under "Grating" in your phone book.

PRODUCTS DIVISION | THE GLOBE COMPANY
4026 S. Princeton Ave., Chicago 9, Ill.



They compared "K" factors and cost factors ...and bought SNAP*ON®

YOUR LOCAL G-B SNAP*ON DISTRIBUTOR IS LISTED IN YELLOW PAGES

Here's how <u>you</u> can reduce the cost of insulating a maze of piping— simply use Snap*On, the original one-piece insulation molded of fine glass fibers. Featherweight 3′ and 6′ Snap*On sections snap over pipe in less time than it takes to tell. Snap*On is flexible, has a resilient toughness that makes it easy to handle and apply in tight spots and close quarters . . . without breakage. And there's no waste.

So outstanding is thermal efficiency that 1½″ Snap*On is thermally superior to most 2″ insulations — more permanent, too. Just ask your local G-B Snap*On distributor to make a TEVA (Thermo-Economic Value Analysis) survey of your pipe insulation requirements — and you will agree there is *nothing* like Snap*On!

GUSTIN-BACON *Manufacturing Co* GUSTIN gb BACON

212 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations . . . molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

NEW JERSEY – The New Jersey Association of Consulting Engineers has appointed a committee to investigate joining Consulting Engineers Council.

Another committee is working in cooperation with the Functional Section of the New Jersey Society of Professional Engineers. Among the matters scheduled for discussion are listing of consulting engineers in New Jersey telephone books. A recent study showed that 22 percent of those listed as consulting engineers are not licensed.

Institute Elects

New president of the American Institute of Consulting Engineers is George S. Richardson, senior partner in Richardson, Gordon and Associates, Pittsburgh.

Other new officers are Emile Praeger, New York City, vice president; Dean G. Edwards, Newark, N. J., vice president; and three counselors – S. C. Hollister of Ithaca, N. Y., and Harold M. Lewis and Gerald T. McCarthy, New York City.

Richardson succeeds Herschel H. Allen, senior partner of J. E. Greiner Co., Baltimore, Md.

Miss on Costs

A study, recently released by the American Road Builders Association, shows that engineers are overestimating highway construction costs or that contractors want the projects badly enough to bid lower than expected.

On a survey of Federal-aid highway projects during the first half of 1958, the average low bid was 10.1 percent below the engineers' estimate. Extremes were in Nevada, where bids ran 25.5 percent lower than the engineers predicted, and in Tennessee, where the average was 1.6 percent above predictions.

They Police Ethics

In the Province of Quebec, any engineer would think twice before violating the Code of Ethics. It not only is frowned upon by other engineers, it hits where it hurts – in the pocketbook.

The Corporation of Professional Engineers of Quebec, not timid about naming the person involved, recently announced that the license of a consulting engineer had been suspended for six months, and during the suspension period the engineer "must refrain from using the title 'engineer' or from practicing his profession under any circumstance or condition."

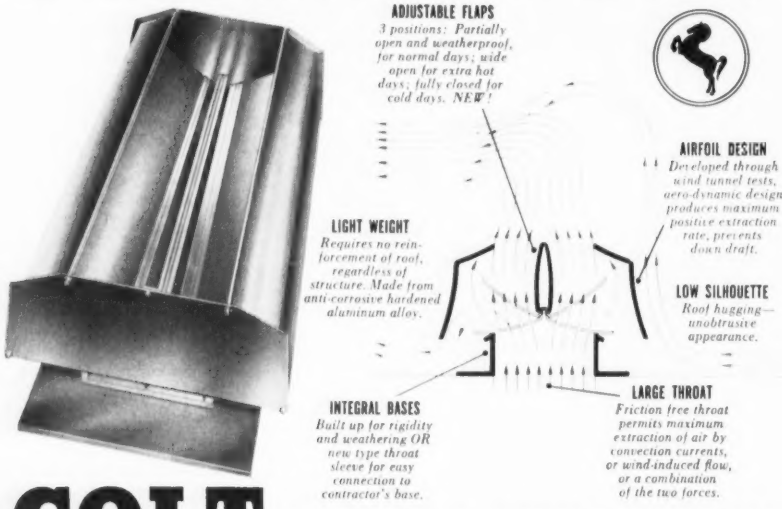
The engineer in question was found guilty of using "unfair means to win professional advancement" and of having failed to "exercise due restraint in criticizing another engineer's work."

In fairness, the Council made it clear that the verdict cast no reflection on the suspended engineer's technical competence, and that he would be reinstated into the professional ranks with all rights and privileges after six months. ▲▲

BRAND NEW!

COLT NEW "O/SR" GRAVITY VENTILATOR

Low Air Flow Restriction — High Exhaust Capacity


ADJUSTABLE FLAPS
3 positions: Partially open and weatherproof, for normal days; wide open for extra hot days; fully closed for cold days. NEW!
AIRFOIL DESIGN
Developed through wind tunnel tests, aero-dynamic design produces maximum positive extraction rate, prevents down draft.
LIGHT WEIGHT
Requires no reinforcement of roof, regardless of structure. Made from anti-corrosive hardened aluminum alloy.
LOW SILHOUETTE
Roof hugging—unobtrusive appearance.
INTEGRAL BASES
Built up for rigidity and weathering OR new type throat sleeve for easy connection to contractor's base.
LARGE THROAT
Friction free throat permits maximum extraction of air by convection currents, or wind-induced flow, or a combination of the two forces.

COLT NATURAL VENTILATION

Throughout the world 45,000 installations prove COLT'S value, economy and efficiency.

WIDE RANGE OF VENTILATORS TO SUIT EVERY NEED — IN STOCK NOW.

FREE TECHNICAL ADVISORY SERVICE AVAILABLE.
WRITE FOR "BROCHURE NO. 59"

Just off the press—20-page catalog which fully illustrates and details the brand new "SR" and "O/SR" Low Silhouette Natural Gravity Type Ventilators with reserve extraction power.

WRITE for additional FREE Literature: (a) New, revised TECHNICAL MANUAL describing the COLT System, (b)"Some Aspects of Fire Prevention in Industrial Buildings", by M. J. Reaney.

COLT VENTILATION OF AMERICA, INC.
4652 Hollywood Blvd., Los Angeles 27, California • NOrmandy 2-1181
Southern California Distributor
RELIABLE STEEL SUPPLY CO., *740 East 111th Place, Los Angeles 59, California • PLymouth 6-8111*

Spokane, Washington Installs BJ Submersibles for Silent Economy

4 Submersible Pumps lift 22,000 GPM from one well!

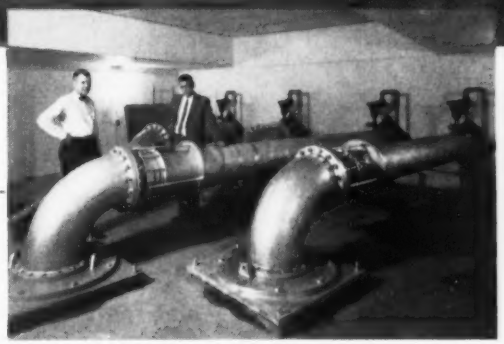
THE NEW AND THE OLD. New Nevada Street Pumping Station houses chlorinators and electric starting equipment only. Rest of installation is underground. Contrast this with size of conventional old-type surface pump house in background.

Spokane's new Nevada Street Pumping Station is another tribute to the "silent economy" of BJ Submersibles. Four 24", 2-stage Submersibles with their close-coupled 400 HP motors work noiselessly in a single well (18 ft. diameter) far below the surface, each pumping 5500 GPM against a head of 249 feet. With all four pumps in operation, the Station can deliver more than 22,000 GPM or 32,000,000 GPD—sufficient to supply a population of 211,000!

By installing four submersibles in one well, the city realized a substantial savings in building costs. Conventional surface pumping installations require extra space and heavy-type construction to support the permanent lifting crane and other equipment. The Nevada Street installation is completely underground, except for one small, inexpensive structure that houses the chlorinators and starting equipment.

The BJ Submersibles operate automatically, with no lubrication and a bare minimum of maintenance. They require no expensive air-conditioning and filtering equipment to remove heat and dirt from the ventilating air—resulting in further economies to the city. Noiseless operation permits location of a submersible pumping station close to the load center. In this installation an estimated 20 feet of head is saved on all water pumped—a saving of $92.00 on each pump during a 500-hour run!

The pumps which were used to develop this high capacity well since have proved themselves under all conditions.



Discharge elbows for 4 submersible pumps. Check valves and flow meters are located just beyond far wall. Entire discharge installation is underground.

Modern starting equipment, located in Pumping Station building. George Oslund, assistant Municipal Utility Supervising Engineer of the City of Spokane, presses "start" button for Pumping Unit No. 1.

Glen A. Yake is Supervising Engineer for all municipal utilities of the City of Spokane. The Spokane Municipal Water Department has earned a reputation as one of the Nation's most progressive.

Write Today for Full, Profitable Details.

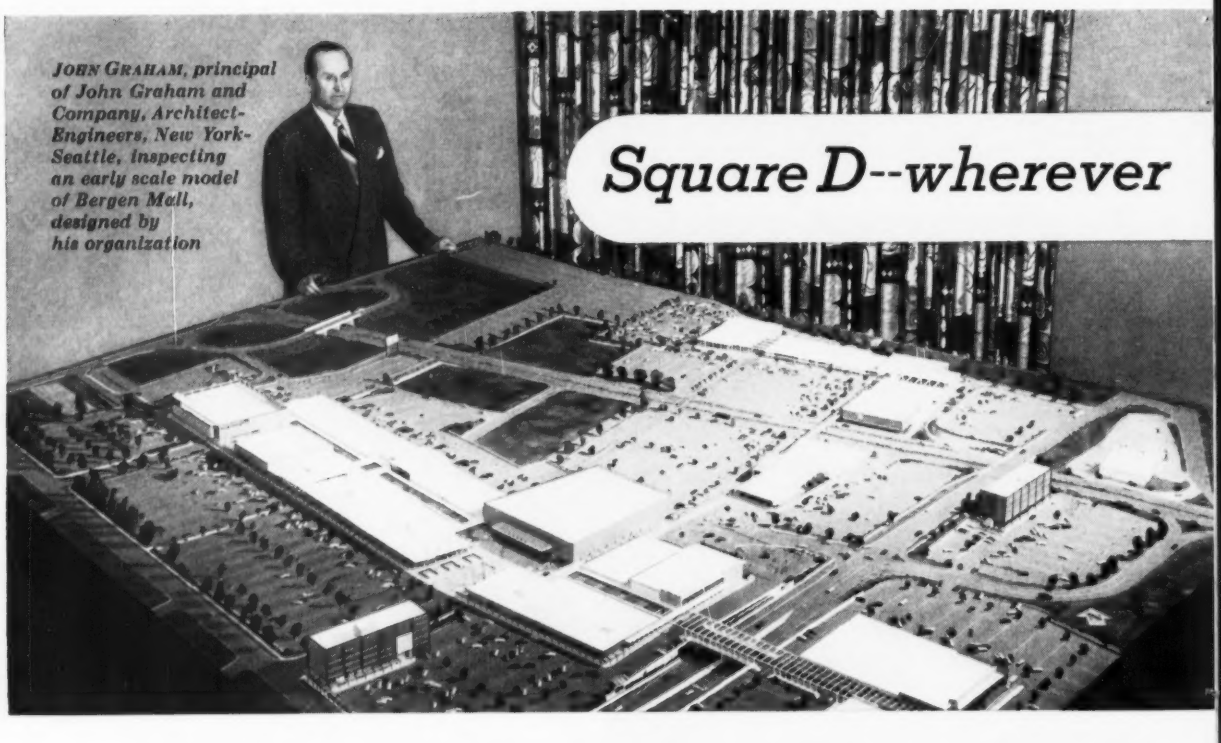
BJ *Since 1872*

Byron Jackson Pumps

INCORPORATED

A SUBSIDIARY OF BORG WARNER CORPORATION

P.O. BOX 70 • LAWRENCEBURG, INDIANA



JOHN GRAHAM, principal of John Graham and Company, Architect-Engineers, New York-Seattle, inspecting an early scale model of Bergen Mall, designed by his organization

There's Nothing Small About Bergen Mall!

• 106 acres! 1,000,000 square feet of retail selling space already built! 1,500,000 square feet of retail selling space with 100 stores, when completed! 8,500 parking spaces! Such is the Bergen Mall regional shopping center in Paramus, New Jersey, built by Allied Stores Corporation. Certainly Allied, who built the world's first regional center in Seattle, Washington, has done itself proud in this tremendous project, rightly called "New Jersey's finest."

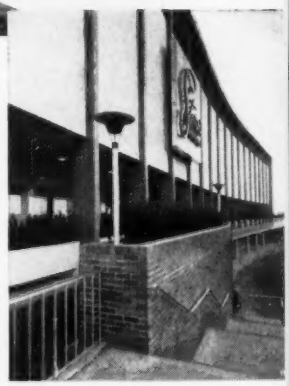
Square D electrical control and distribution equipment is "on duty" throughout this big and architecturally beautiful shopping center.*

FIELD ENGINEERING SERVICE is available to architects and consulting engineers through more than 100 Square D offices, backed by 1000 authorized electrical distributors and 19 plants in the United States, Canada, Mexico and Great Britain.

Executive Offices • 6060 Rivard Street, Detroit 11, Michigan

*Electrical Contractor,
WATSON-FLAGG ENGINEERING COMPANY, PATERSON, N.J.

(*Above*) Only one main street ...a proven way to generate heavy shopping traffic. The central Mall, 920 feet long, is designed to create a park-like atmosphere.



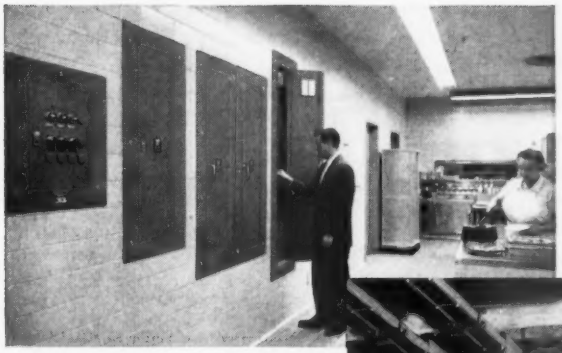
(*At right*) The new Stern's department store is a thing of functional beauty. 320,000 square feet on four levels—a total of more than seven acres of space. Exterior combines use of marble, red brick, rough-cut stone and large glass areas.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

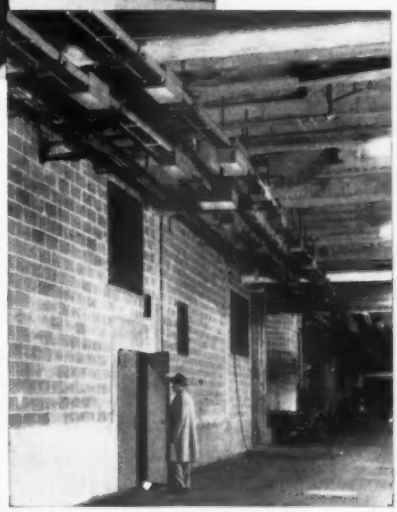
SQUARE D COMPANY

electricity is distributed and controlled

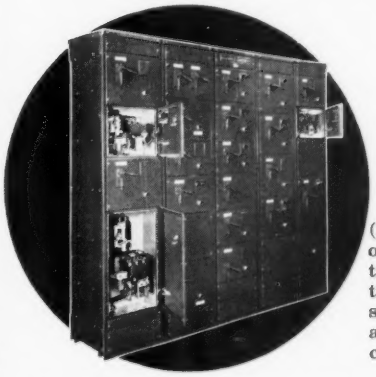
Here's An Outstanding Example of Square D Equipment and Field Engineering Service *In Action!*



There are hundreds of **Square D Lighting and Power Panelboards** throughout Bergen Mall. These are in kitchen area, and control lighting for the Stern dining room and power for kitchen equipment.



(*At right*) **Square D Feed-In Duct** runs the full length of this half-mile truck concourse, distributing power to the stores on both sides.

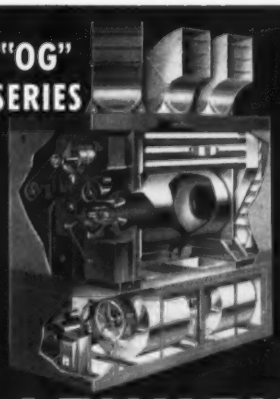


(*At left*) A **Square D Control Center** of this type provides complete control for the air-conditioning system in the Stern store. In addition, there are seven **Square D Switchboard** installations with a total combined ampere capacity of 22,500 amperes.

A *Complete* LINE OF ELECTRICAL DISTRIBUTION AND CONTROL EQUIPMENT

ADJUSTABLE SPEED DRIVES
BUSWAYS & WIREWAYS
CIRCUIT BREAKERS
CONTROL CENTERS
CRANE & HOIST CONTROL
DISTRIBUTION SWITCHBOARDS
ELECTRIC TRUCK CONTROL
HIGH VOLTAGE CONTROL
LAUNDRY CONTROL
LIFTING MAGNETS
LIGHTING AND POWER PANELBOARDS
LIGHTING CONTROL—LOW VOLTAGE
LIMIT AND FOOT SWITCHES
MACHINE TOOL CONTROL
MAGNETIC BRAKES
METER MOUNTINGS
MOTOR STARTERS
PRESS CONTROL
PRESSURE, FLOAT, & VACUUM SWITCHES
PUSHBUTTONS
RELAYS AND CONTACTORS
RESISTORS
SAFETY SWITCHES
SERVICE ENTRANCE EQUIPMENT
STAGE DIMMERBOARDS
STEEL MILL CONTROL
SWITCHGEAR & UNIT SUBSTATIONS
SYNCHRONOUS MOTOR CONTROL
TERMINAL BLOCKS
TEXTILE MACHINE CONTROL
TIMERS
VOLTAGE TESTERS
WELDER CONTROL

"OG" SERIES



LENNOX

GAS...OIL...OR NEW TYPE

Dual Fuel

POWER BURNERS

Combination burners are available for the "OG-4," and are interchangeable with single fuel burners. All burners are of the same general construction; switching from dual fuel to a single fuel burner involves changing only one or two minor parts. On all burners the combustion air is pre-heated. "Push button" changeover from one fuel to another and electric gas ignition give added ease of operation and safety to the combination burners. Write today for the full story.

LENNOX "Task Matched" Equipment to control and condition air for industry

64,000 to 2,000,000 Btuh Units

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
Box 1294, Dept. CE-3
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name_____

Company_____

Address_____ City_____

Title_____

The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The Law of Real Property: Liens

SECURITY RIGHTS are those rights in the land of another that protect a debt owed the holder of the security. In real property law, the three major devices for providing such security are liens, mortgages, and land contracts. The principal types of liens are tax liens, special assessment liens, and mechanics' liens. Of these, mechanics' liens are of considerable importance in engineering practice.

Liens Defined

A lien may be defined as an interest in property, which is limited to security for the payment of a debt owed the lienor (person having the security), and which arises by operation of law rather than by agreement. It is necessary that a debt be owed the lienor, but it is not necessary that it be owed him personally by the person owning the land subject to said lien. In fact, the person owning the property frequently is not the one who owes the debt, but his property nevertheless is subject to the lien.

Mechanics' Liens

Real property construction liens are statutory. They do not exist at common law. This makes it necessary to investigate carefully the law of the particular jurisdiction involved before any precise conclusions can be drawn. However, there are enough similarities from jurisdiction to jurisdiction to warrant some generalizations.

Real property construction liens, oddly enough, generally are called mechanics' liens. This is a very poor choice of language since there also exists a common-law mechanics' lien, which relates solely to personal property and which is governed by entirely different principles. The inevitable confusion leads to much fun and profit for lawyers, so it is not all loss.

Similarities

The only point of similarity between the statutory real property lien (so-called mechanics' lien) and the common-law personal property lien (honest-to-goodness mechanics' lien) is that both provide security against property which has been increased or maintained in value by improvements made by the lienors, where the latter have not been paid. With the real property mechanics' lien, material suppliers and laborers – and sometimes subcontractors, contractors, or the consulting engineer or architect – are entitled to a lien on the real property involved if they have not been paid. It does not matter whether the one who owes them the debt is the owner, the contractor, or a subcontractor; if the debt has not been paid, the real property is security for it.

Unlike the personal property mechanics' lien, the real property mechanics' lien does not arise automatically when the improvement is made. It must be "perfected" by filing notice in a way and within a

LADISH

Controlled Quality

LIGHT WEIGHT
WELDING NECK
FORGED FLANGES
125 POUND

TO MARK PROGRESS

Reduce cost... eliminate breakage of cast flanged-end piping components when bolting to steel welding neck flanges

PIPING PROBLEM:

(1) Difficulty experienced in making pressure tight connection with flat face flanges with full face gaskets.

(2) Breakage of relatively brittle cast iron flanged ends on valves, pumps and other piping components when bolted to standard 1/16" raised face steel flanges.

LADISH SOLUTION:

The 125 pound Light Weight flange developed by Ladish is an ideal solution to this problem . . . for not only does it solve the problem . . . but it provides significant additional advantages of cutting purchase costs and reducing weight.

You can depend on Ladish for leadership in introducing piping developments to reduce cost and improve service.

A national network of distributors, Ladish plants and sales offices is ready to serve you.

Specification sheets on Light Weight Flanges and Welding Fittings available on request.

POSITIVE, LEAK-TIGHT JOINTS

Proven design principle of raised face flange has been adapted to assure a completely safe, positive connection to class 125 cast iron flat face flanges.

ELIMINATES NEED FOR HEAVY FLANGED ENDS ON VALVES AND PUMPS

No longer is it necessary to pay a premium to obtain the heavier flanged end valves, pumps and other piping components required to withstand bolting to raised face steel flanges in a welded piping system.

LOW WEIGHT—AMPLE STRENGTH

Light cross section design reduces weight to 30-50 per cent of ASA 150 pound Welding Neck Flange . . . still possesses ample strength to assure safe, leak-tight joint with mating cast flange.

LOWER COST

Savings in purchase price of Light Weight flanges are supplemented by additional savings realized by selecting valves on the basis of pressure rather than strength characteristic of flanged ends.

EASE OF INSTALLATION

Adequate welding neck type hub length keeps welding heats safely from flange. Prevents unpredictable warpage and deformation. Light weight facilitates handling, speeds positioning and installation.

MINIMIZES PIPEFITTER PRECAUTIONS

Safe and suitable for use with either carbon or alloy steel bolting . . . either full face or ring gaskets, in 1/16" or 1/8" thicknesses.

PRESSURE-TEMPERATURE RATING

Rating corresponds to ASA B16.1 class 125 cast iron flanges . . . 125 PSI (gauge) saturated steam; 175 PSI (gauge) water, oil or gas at 150° F.

SERVICE APPLICATIONS

Widely accepted for low pressure piping in gas distribution service . . . utility services such as water, heating, air conditioning, refrigeration . . . pumps and compressors.

TO MARK PROGRESS

LADISH CO.

CUDAHY (Milwaukee Suburb) WISCONSIN

SALES OFFICES: Amarillo • Atlanta • Baton Rouge • Buffalo • Calgary
Chicago • Cincinnati • Cleveland • Denver • Havana • Houston • Los Angeles
Mexico City • Montreal • New York • Odessa • Philadelphia • Pittsburgh
St. Louis • St. Paul • San Diego • San Francisco • Seattle • Toronto • Tulsa

SAW BLADES • PIPE FITTINGS • DROP FORGINGS • RINGS • VALVES

LADISH...THE FITTINGS LINE THAT OFFERS COMPLETE SERVICE IN TYPES, SIZES AND MATERIAL SPECIFICATIONS

WELDING FITTINGS	ASA & MSS FLANGES	SCREWED & SOCKET FITTINGS & UNIONS	LONG NECKS	LARGE DIAMETER & T.E.M.A. FLANGES

THIS can be your launching pad to a better new plant space...

Choice plant sites in B&O's Land of Big Opportunity with the *markets* you want—industrial or consumer, domestic or foreign. *Check* the B&O area, with our help!

Plan with a B&O man!

PHONE OR WRITE:

T. G. GORDON, Industrial Agent
BALTIMORE 1 LExington 9-0400

G. E. FERENCE, Ind. Development Agt.
NEW YORK 4 Digby 4-1600

A. C. TODD, Industrial Agent
CINCINNATI 2 DUnbar 1-2900

FIELDING H. LEWIS, Industrial Agent
PITTSBURGH 22 COurt 1-6220

W. E. OLIVER, Industrial Agent
CHICAGO 7 WAbash 2-2211

B&O BALTIMORE & OHIO RAILROAD

Constantly *doing things*—better!

period of time provided by statute.

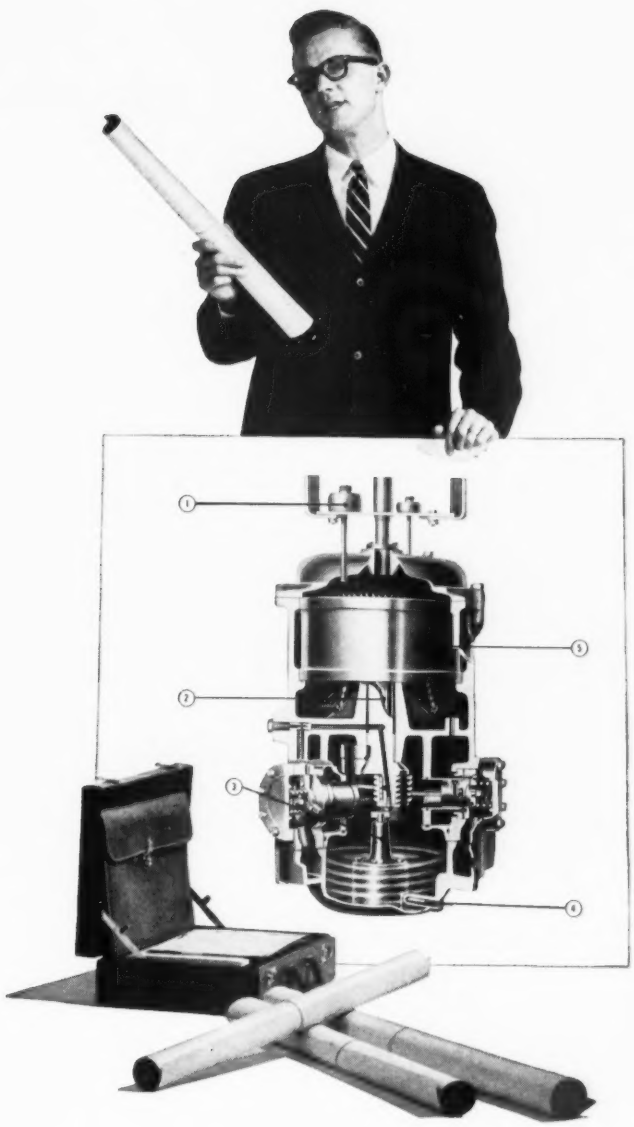
It generally is required that the notice of lien be filed in a prescribed public office, such as the register of deeds, within a period of from 20 days to 4 months, depending on the jurisdiction. In addition, it generally is provided that persons who have not been dealing directly with the owner also must give him personal notice of the filing of such lien statement. When these conditions have been satisfied, the lien is "perfected," and it then relates back to the time when the labor, services, or materials were supplied.

If the proper notices are not given within the prescribed time, the lien is held to be waived. It also may be waived by express agreement of the parties to the original contract, by a subsequent agreement which is binding because of consideration given for it, or by inequitable conduct which prevents the lienor from asserting his lien against the owner (e.g., where he previously told the owner that he had been paid by the contractor, and the owner has relied on this statement in paying the contractor).

Enforcement

Mechanic's liens are enforced by compelling a public sale of the property, out of which proceeds the lienor is paid. The procedure is prescribed by statute and is similar to foreclosure of a mortgage.

It sometimes happens that the owner pays everything to the contractor, but the contractor fails to pay a subcontractor, laborer, or material supplier. Under these circumstances the owner normally has not had any direct dealings with the creditor in question and is under no personal contractural duty to pay him. The only contractual right of the creditor in question is against the defaulting contractor. Nevertheless, a lien exists against the owner's property, and unless the lienor is paid he can foreclose on the lien to obtain his money.



Here are 5 of the 18 reasons why it pays to pick Chrysler Liquid Chillers

Cooling for comfort? Or cooling a process? Only Chrysler Airtemp SW Liquid Chillers offer so many exclusive engineering advantages. Take the hermetically-sealed radial compressor, for example. You get:

① *Floating power.* Rubber-in-sheer suspension absorbs vibration. Noise is gone . . . and so are vibration-caused service headaches.

② *Direct drive.* No belts, no pulleys, no seals to break down. You get greater efficiency, less noise from a more compact package.

③ *Positive lubrication.* Exclusive pressure pump is sealed in a bath of oil. Moving parts get constant lubrication for long, trouble-free life.

④ *Crankcase heater.* Prevents refrigerant from condensing and diluting lubricant. Oil stays clean . . . and always ready to flow.

⑤ *Sealed-in motor.* Dust-proof for longer service life. Directly connected to dynamically balanced crankshaft to cut weight and operating costs.

The rest of the 18 reasons? They include innerfin direct expansion chiller, automatic control panel, easier installation and . . . But why not get the complete story from your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. X-39, Dayton 1, Ohio.

CHRYSLER AIRTEMP

FIRST WITH THE FINEST IN AIR CONDITIONING

Then if the owner is unable to make the contractor pay, he no doubt will have to do so himself. Of course, if the owner pays, he has available an action against the contractor, but this may not be worth much in practice in view of the fact that the latter already has failed to pay the lienor.

Thus, it is very clear that the owner must be very cautious before making his final payment to the contractor. He should be certain that all debts which could result in liens have been paid. Preferably, the general contract also should allow him to withhold from the contractor a substantial percentage of the total amount, until such time as all notices of lien would have to be filed.

Status of Government Property

Any real property that has been improved in the ways described may be subjected to a statutory mechanics' lien, except public property – property owned by the government or a governmental agency.

To protect persons supplying labor and material for public projects, it sometimes is provided that they shall have a lien on the money. That is to say, they have a direct claim against the government or governmental agency for the amount due them, even though there have been no direct dealings between them and the governmental agency. The law on this point, however, varies from jurisdiction to jurisdiction.

Priority of Mechanics' Liens

A mechanics' lien relates back to the time when the labor, services, or materials were furnished. However, under the general rule, all mechanics' liens arising against specific property out of the same construction project have equal priority, regardless of the exact dates of making the improvements.

Because of this "relation-back" rule, the mechanics' liens have priority over mortgages that are placed on the property after the construction work has started. Thus, a person taking a first mortgage on real property that is in the course of being improved may find himself in a junior position with respect to mechanics' lienors, even though he has searched the public records for titles, mortgages, and liens, and has found no such encumbrances on the record.

In short, it is a dangerous practice to buy real property, or to take a mortgage on it, if construction work is in progress at the time. ▲▲

Are you burning a lot of midnight oil when faced with tough wire and cable problems?

MEET THE MAN WHO CAN HELP YOU...

. . . on page 32

have you got the facts on money-saving preventive maintenance with

Torit dust collectors?

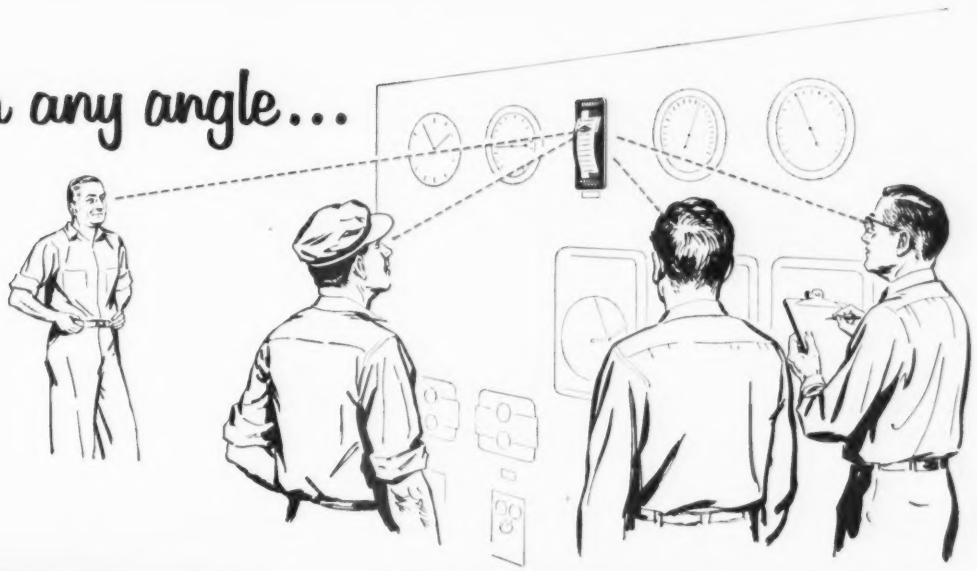
Clean machines hold close tolerances *better* and *up to 80% longer*. Result: a measurable saving in both the cost and frequency of servicing and maintenance work. You can protect your client's plant and equipment investment, help reduce potential production breakdowns, by specifying TORIT Dust Collectors. In the cabinet type (illustrated by cutaway drawing) filters are rated 99.99% efficient by weight on particles as small as ½ micron! Compact Torit high efficiency cyclone and cabinet type units are designed to save space, install anywhere. Your Torit representative will gladly give you dust collector specifications, performance charts, dimensional drawings and installation suggestions. Write:

TORIT MANUFACTURING CO.
Walnut & Exchange Streets, St. Paul.2, Minn., Dept. 1617

Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for $1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER, 217 Wayne St., St. Joseph, Mich.

from any angle...



BOILER WATER LEVELS ARE EASIER TO READ with YARWAY INDICATORS

No matter where you stand, you can see at a glance your boiler water level in the Yarway Remote Liquid Level Indicator. The clear, "wide vision" face permits easy readings from any point in a 180° arc.

Readings are instant and accurate because the operating mechanism is actuated by the boiler water itself—by the pressure differential between a constant head and the varying head of water in the boiler drum. Pointer mechanism is never under pressure.

Yarway Remote Indicators are available fully compensated for every change in boiler temperature and pressure and they can be connected to Electronic Secondary Indicators or remote Hi-Lo Alarm Signals (lights or horns), located at any other point in the plant. Also available, Yarway Recorders working on same simple principle.

Over 12,000 Yarway Remote Indicators already installed.

Write for full details on Yarway Indicators for boilers, heaters and other applications. Bulletin WG-1824 tells all, shows typical hook-ups.

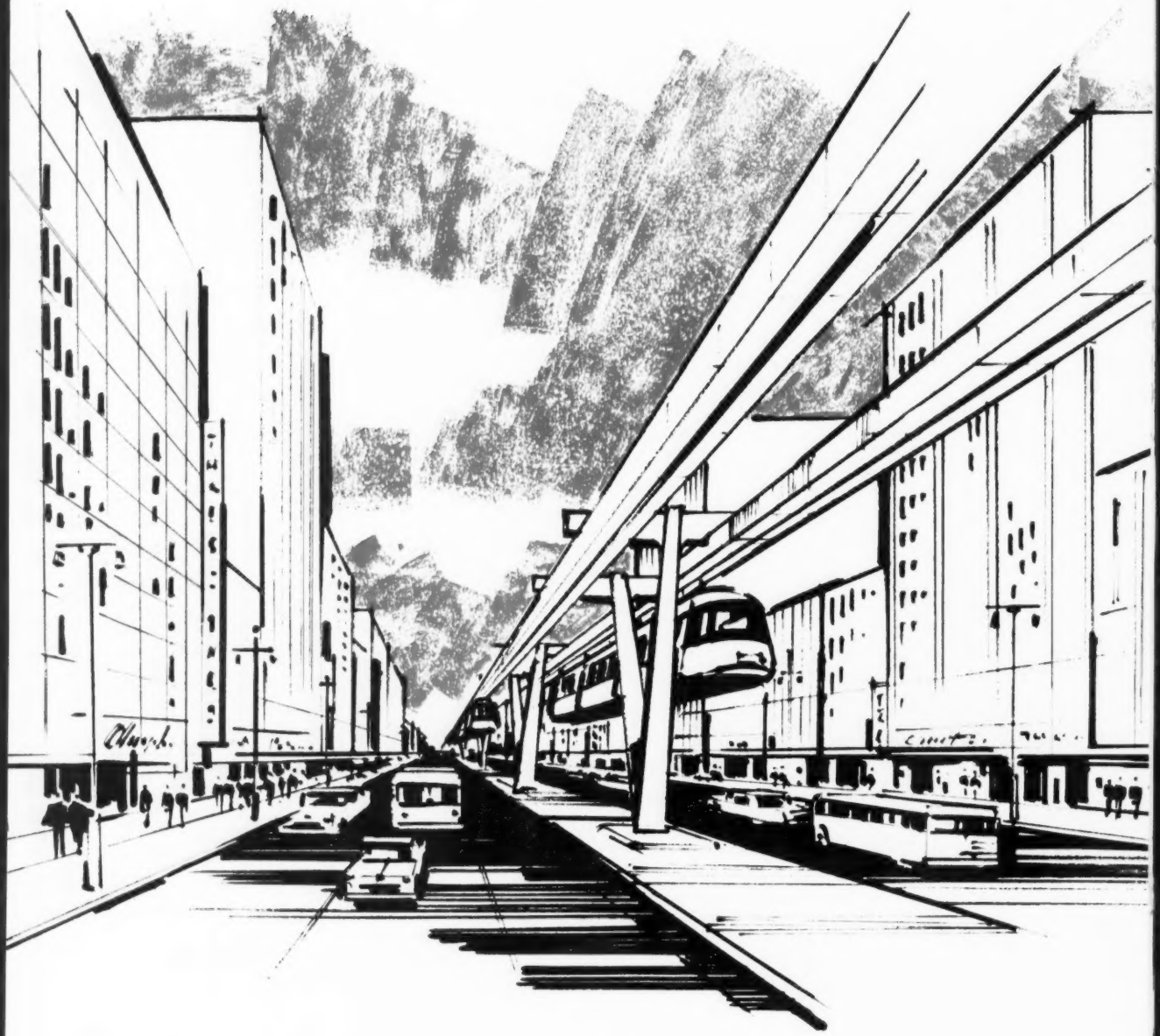
YARNALL-WARING COMPANY
106 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY

...a good way to specify remote liquid level indicators

Mass Rapid Transit To Serve the Super Cities

IRVAN F. MENDENHALL
Daniel, Mann, Johnson & Mendenhall



THE PROBLEMS confronting transit engineers in centralized cities have been well defined for many years and in some compact cities have been solved – at least temporarily. But the current trend is toward the vast, sprawling super city – broadly defined as an extensive urbanized area with many small and large cities sharing boundaries and facing common problems of terrain, traffic, and transportation of goods and people. For the engineer, this raises a new set of problems:

¶ Will mass rapid transit be an essential part of the communication network in a super city?

¶ Can the drawbacks of widely scattered employment and residential concentrations, low population density, enormous area, and heavy competition from private autos be overcome by engineers?

¶ If mass rapid transit is the answer, what methods will be most effective?

Limitations of Freeways

I believe that mass rapid transit will be an essential part of the communication network in a super city. There is no doubt that automobile travel will play a greater role in super cities than in centralized cities, but this does not mean that freeways or toll routes will meet all transportation needs. Los Angeles, for example, which is already a prototype super city, has not found relief from traffic congestion or parking problems despite the fact that the Los Angeles freeway system is recognized as the world's most advanced.* Freeways must eventually funnel down to narrow city streets, and each freeway driver carries with him 400 cubic feet of machinery that must be stored before his destination can be reached. It is estimated that if all commuters to a business district arrived by automobile, more than half the total floor area of all the buildings would be occupied by empty automobiles.

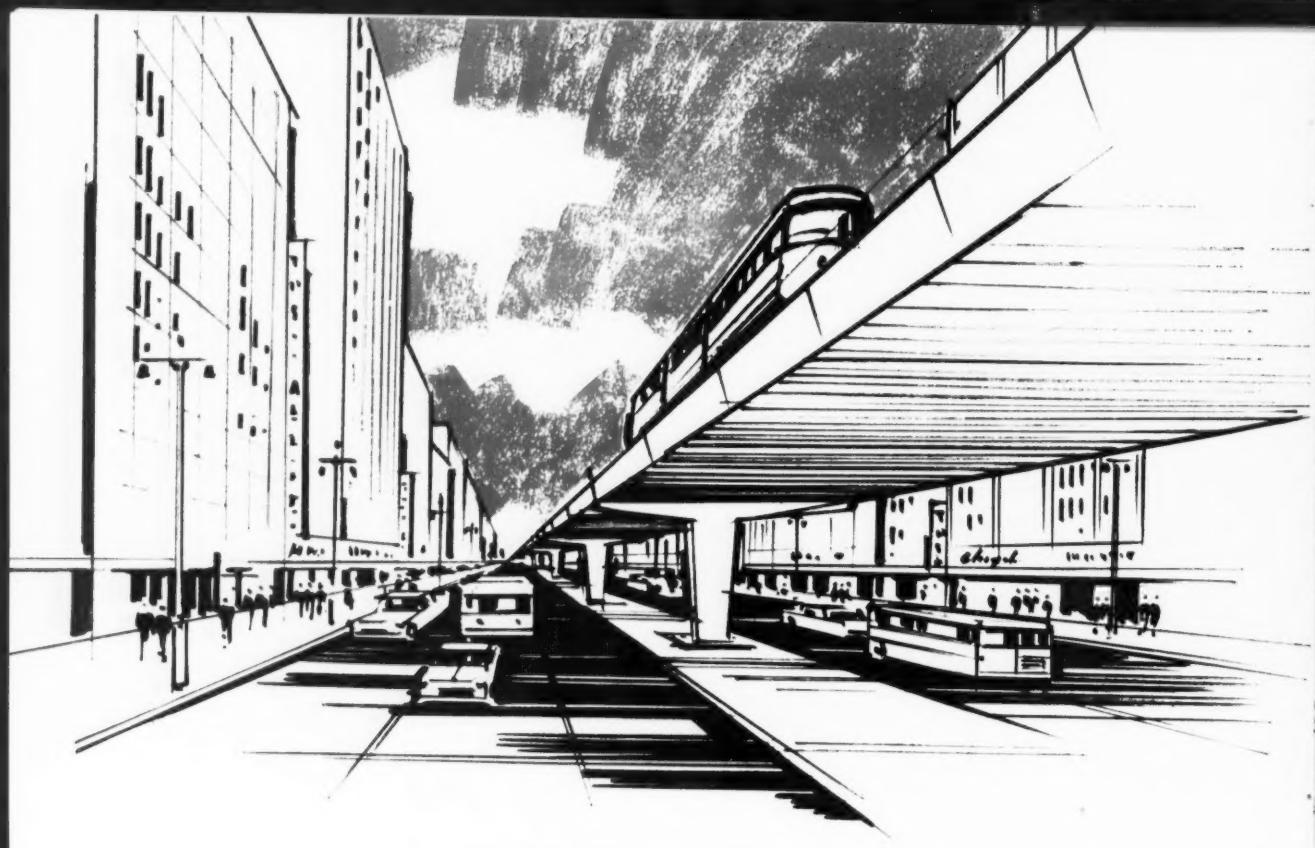
The problems of low population density, dispersed employment and residential concentrations, huge area, and fierce competition from private autos have not as yet been solved by a single integrated freeway – mass rapid transit system, but evidence accumulating in cities throughout the world indicates that they can be solved. That automobile drivers can be induced to use new rapid transit facilities is shown by examples in Toronto and Cleveland, where recent traffic studies indicate that 5 to 10 percent of the persons formerly using private automobiles were attracted to new rapid transit facilities. Yet the rapid transit facilities in these two cities are the same type that have been in operation since the turn of the century. The equipment has been improved, but there were no radical changes in basic design. It is reasonable to assume a radically improved transit facility, sufficiently extensive in its system throughout the super city, would induce a far greater percentage of automobile drivers to leave their cars at home.

Cities have found that extensive networks of high speed freeways meet only part of the transportation needs.

New Transit Equipment

New equipment and attractive stations have helped sell rapid transit to the public in cities such as Toronto and Chicago. Speed and comfort, two factors in which rapid transit must excell, are being improved continually. Escalators at both elevated and subway stations have helped produce more satisfactory conditions for the transit rider. Air conditioning eventually will be placed in most rapid transit equipment, and research is being directed toward the development of better running gear to

*The Los Angeles freeway system currently is the most extensive and heavily used in the world. Over 650,000 vehicles per day use some part of the present system, yet only approximately 25 percent of the ultimate projected length of 1667 miles by 1980 is in service.



Proposal for New York City suggests elevated bus-trains, using rubber-tired cars designed to run on special roadways.

make higher speeds safe, vibration-free, and quiet.

Subways and Suspended Trains

Developments, such as the rubber-tired subway cars in Paris, also have revolutionized attitudes toward subways. The clattering roar, known to all subway riders in Chicago, New York, Philadelphia, and Boston has been reduced to a mere whisper on certain lines of the Paris subways.

A new proposal in the field of subway facilities considers the use of relatively small tunnels that could be produced at far less cost than the standard subway sections as presently in existence in eastern cities. This particular proposal envisions a neighborhood network to provide rapid transit service within walking distance of all residences. This type of facility necessarily would cover hundreds of miles and therefore would cost billions of dollars to construct for a large city.

Such a system has merit, however. The extensive system of tunnels would be readily accessible shelters in the event of an atomic war. Also, such a system produces an unlimited pattern of potential trips through the use of automatic equipment in various connecting loops and shuttle trains. It may be the answer for some super cities.

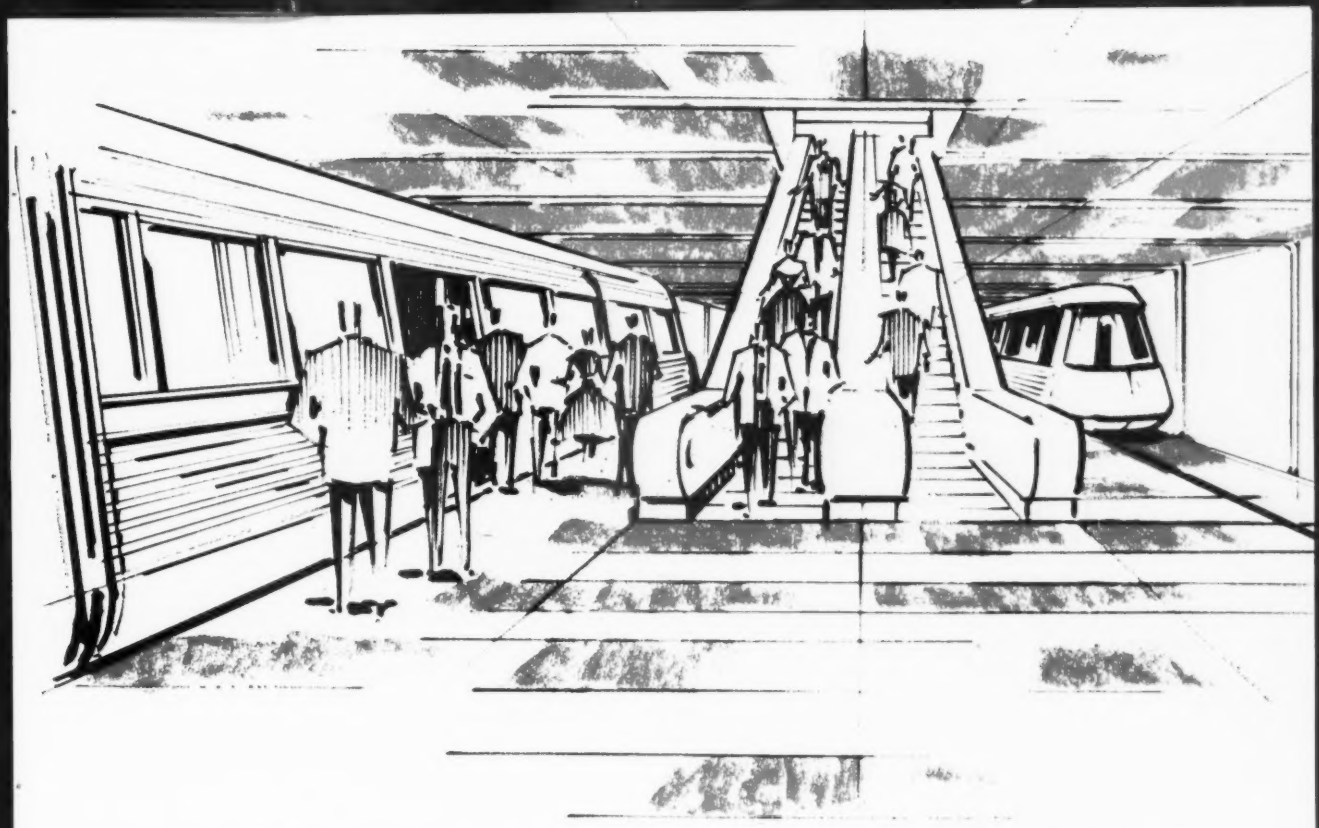
Use of suspended trains is not a new proposal. The Wuppertal Valley Monorail has been operating in Germany for 55 years. Recent technical advances go far toward answering problems posed in today's use of suspended trains. These advances include the use of automatically controlled pneumatic suspension and positive control of sidesway.

In one new design the cars are suspended from a load-bearing rail above and stabilized by an additional rail either above or below. This system has the effect of reducing sway and greatly adding to the comfort and stability of the cars.

In the split rail system, another interesting design, the vehicle is suspended from a hollow girder that encloses the running gear. This system is far superior to the earlier concepts of monorail suspension. Latest innovations include novel switching developments incorporating quick action switches with fail-safe features.

Elevated Bus-Trains for the Super City

Another new proposal, described in 1955 in a report entitled "Aerial Transit in the New York Metropolitan Area," suggests the use of rubber-tired cars operating on special roadways. These roadways could be at surface grade in the outer portions of the system. They could be either underground or overhead in the more congested sections of the route



Rapid transit must provide speed and comfort. Escalators at both subway and elevated stations will be necessary.

and could be constructed on existing bridges or run through new or existing tunnels.

Equipment and Public Policy

It generally is agreed that all proposed systems could provide the required qualities of a modern transportation system – safety, comfort, convenience, quiet operation, rapidity of movement, attractive design of equipment, and moderate cost to the passenger. The proposed rolling stock for these installations is feasible from an engineering standpoint, and operation on pneumatic tires already has proven feasible for high speed transit.

Therefore, though the super cities will admittedly present challenging problems to the mass rapid transit designer, all evidence indicates that these can and will be surmounted – at least in their engineering aspects. But the engineer will not be concerned solely with the matter of designing the mechanical equipment and details of a transit system. He also must consider various public policy factors, economics, and mass transportation probems in general.

It will not be sufficient to produce lines on a map showing coverage of area from a technical standpoint, nor will it be sufficient to design equipment capable of operating at 100 miles an hour without also considering the effect on the potential rider and on the community through which this equipment must operate. These nontechnical factors – an important facet of every engineering job – obviously will be different for each city. Therefore, the exact methods and systems must be individually tailored to fit the specific needs of each city.

The Los Angeles Approach

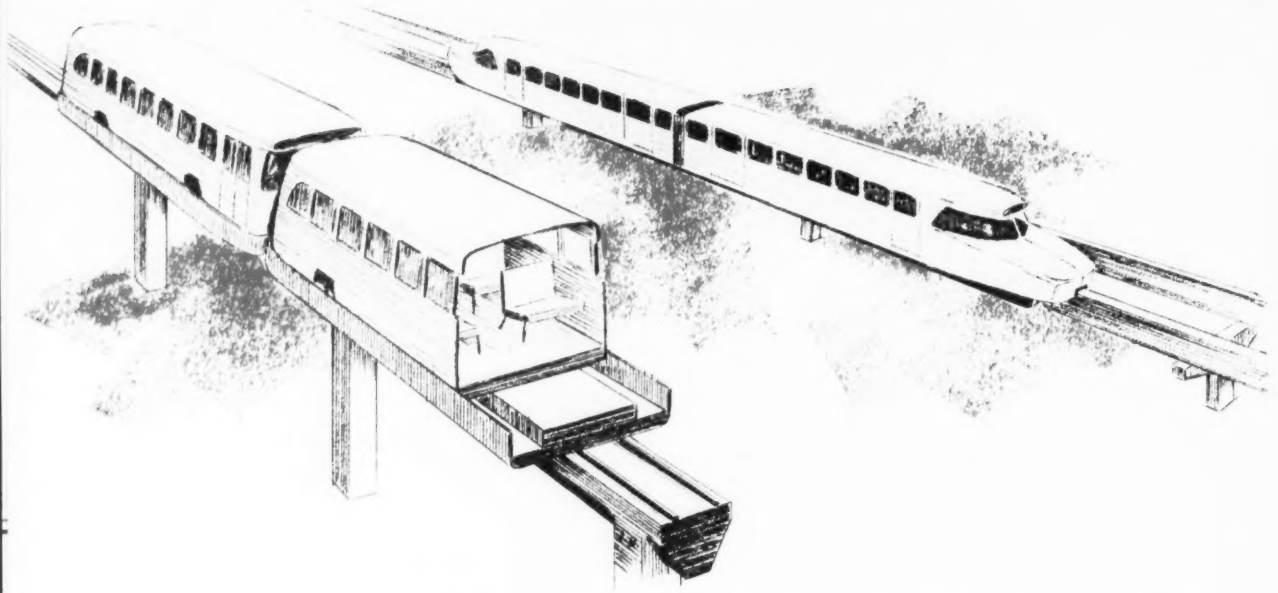
It is instructive to examine the approach being taken by Los Angeles, and to study some of the systems currently under consideration as answers to the problems of transportating goods and people in this rapidly growing area.

Transportation of goods via motor carrier and the provision of adequate highway facilities is being handled jointly by the California State Division of Highways, the Los Angeles County Road Department, and the City of Los Angeles.

The mass transit problem is being handled by the Los Angeles Metropolitan Transit Authority, whose jurisdiction extends throughout the 4866 square miles of the Los Angeles metropolitan area.

Mass Transit System

Following its formation the Authority's first important move was to take stock of the needs of the



Unibus piggyback system, left, employs removable pod passenger bodies; Alweig saddleback system is at right.

community through various surveys. These surveys, when completed, will provide trip patterns throughout the Los Angeles area and will be used as a basis for evaluating proposed types of mass transportation systems and facilities. At the present time no one knows what the over-all trip patterns might be, but it is clearly evident from the morning and evening congestion on the Los Angeles freeway system that there is a tremendous crosstown interchange of traffic. For the most part there is a fairly balanced flow morning and afternoon, which may be a saving factor in the economic use of rapid transit equipment.

The Selection of a System

After the Authority has taken stock of the needs of the community, it will be faced with a most difficult task of selecting a mass rapid transit system, and equipment for that system. The system selected will have to be sufficiently attractive to the general public from the standpoint of speed, comfort, fare, and flexibility in order to be successful in diverting great numbers of present-day automobile commuters to mass rapid transit.

A system must be chosen that will make possible a complete coverage of the metropolitan area so that one would not feel stranded without his automobile. The system must produce average speeds in excess of those obtainable through the use of the private automobile, and with relative comfort.

Construction Cost

The construction cost is extremely important in this most extensive of all American cities. If subway construction is considered, the most modern automatic equipment techniques must be used to produce maximum economy. The consideration of elevated structures will require investigation into lightweight rolling stock, and the production of a structure which is aesthetically acceptable. Whatever form the system takes, it will be measured in the hundreds of miles, and therefore economies in design and construction are of great importance.

Expansion Potential

Each step in the program of developing a rapid transit system also must be examined from the standpoint of its future development and potential for expansion. These factors can be summed up in the following questions:

¶ Would the proposed transit facilities provide the dramatic improvement in transportation service required to gain acceptance of the general public?

¶ Does the initial plan permit future expansions without undue complication?

¶ What weight should be given to the capital cost of a system, the financial results, and the public benefits that accrue?

¶ What difficulties might arise in obtaining any necessary rights-of-way through various communities in the area?

These and other questions must be taken into consideration by the Los Angeles Metropolitan Transit Authority in evaluating the proposed mass rapid transit systems.

The systems currently under study by the Los Angeles Metropolitan Authority include subways, overriding elevateds, suspended elevateds, and

double deck freeways. No official comment is available from LAMTA at present on the merits of these systems for use in Los Angeles, but being well acquainted with transportation problems in this area, I will hazard a few opinions of my own.

An Elevated System

Probably the greatest difficulty to be faced in the development of elevated transit in the Los Angeles area, either overriding or suspended, would be gaining public acceptance of the elevated structures either above the sidewalk or in the centers of streets and highways. In reviewing this phase of elevated proposals it should be recalled that there has been strong public sentiment against elevated structures of any type in residential areas or in areas of concentrated commercial activity. This attitude may persist despite the refinement in design and the elimination of noise through the use of rubber-tired trains. Station facilities and stairways and escalators do take up sidewalk space and reduce natural light in the areas below the station platforms.

On the other hand, modern design can greatly improve the antiquated system of past years and will in all probability eliminate some of the public resistance. The elevated systems do have many obvious advantages, and they certainly can provide the essential factors of speed and comfort.

There are various forms of monorail which must be given serious attention. These include the override and suspended systems. Test sections have been built, and improved design details indicate that workable monorail systems are possible. The limitations with regard to flexibility and construction cost are undergoing almost continuous study, and sections of this type are considered entirely feasible for certain routes.

Subway Systems

Subways could be a desirable system for Los Angeles, particularly if they utilized small tunnels. There would be no exposed structure to mar the city landscape, no adverse effect on surface land values, and almost complete flexibility in layout of routes. Recent improvements in rolling stock could be used to provide a very quiet and comfortable ride. It is quite possible, however, that the high cost of conventional subway construction will eliminate this method for this area.

Double Deck Freeway

The double decked freeway offers several advantages if the second deck is used for mass rapid transit vehicles. This structure probably would not meet with the same general public resistance as other elevated structures, and there would be no problem of right-of-way or adverse effect on surface land values. Here again the cost would be extremely high.

Unibus

Another proposed system that might be particularly adaptable to Los Angeles is the Unibus system. In this system surface busses converge at a number of centralized points in the suburban area, are put aboard self-propelled platform cars which travel at express speeds to the central areas, and then are unloaded to continue their journey around the central area. The system would involve the use of either subway or elevated lines for the express journey to the central city.

Removable Pods

A further refinement of the Unibus system calls for removable pod passenger bodies which could be removed from the busses, loaded on the express lines, then placed back on different chassis at the end of the line. A similar pod technique has been proven workable in the Clark Mobilvan system for piggyback transport of freight trailer bodies on railroad cars.

The Unibus system would have a very strong advantage for Los Angeles in broad area coverage at reasonable cost. Another advantage is that the passenger vehicles would not need to stand idle on express lines during the low load hours. During the peak commuter hours, the busses could be concentrated near the employment and residential areas, and during the lull they could be free to move about other areas as surface busses.

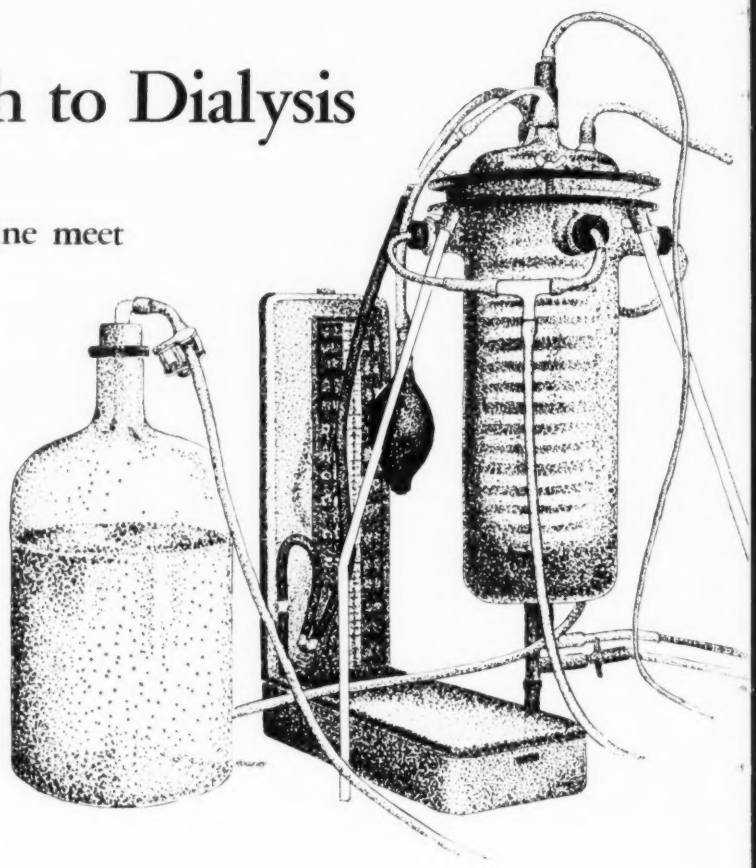
Unique Opportunity

In choosing a mass rapid transit system Los Angeles has the opportunity of being free to choose the best system without regard to existing rapid transit facilities, because it has none. As a result of its unusual growth pattern, Los Angeles has relied almost exclusively on the automobile for transportation. But it is quite clear that without mass rapid transit the city will face insurmountable congestion problems in the future. Projection of the population growth, automobile use, and congestion factors to the year 1980 produces an almost inconceivable volume of traffic. And the vast super cities now forming throughout the country are tending toward the Los Angeles pattern.

I maintain that the problem is known, that application of our technical knowledge can produce an economic system of transportation for our super cities, and that the consulting engineers and transit experts planning for transportation of goods and people in tomorrow's super cities can and will develop satisfactory and perhaps novel solutions. ▲▲

New Approach to Dialysis

. . . Engineering and Medicine meet to find a better solution to an important processing problem



LOUIS J. GUARINO, P.E.
and
JOHN R. GUARINO, M.D.

MYSTERIOUS QUALITIES were ascribed to the semipermeable membrane many years ago when man's first attempts to water cool wine in a sheepskin led to spontaneous rupture of the container. It was not until 1860 that Sir Thomas Graham, the Scottish chemist, put the membrane to purposeful scientific use when he separated substances in a mixture by means of their different rates of diffusion through the semiporous membrane wall. He called the process dialysis. The procedure since has become indispensable in industry, chemistry, and medicine. It is used in the processing of foods, milk, vitamins, drugs, sera, extracts, and enzymes. It is also valuable in the clinical detoxification of blood (artificial kidney), and in the manufacture of rayons and other synthetics. The dialyzer is standard laboratory equipment in the analysis, identification, purification, and isolation of substances. As a research tool it has led to the discovery of new compounds. Important applications in new fields arise continually.

Commercially available dialyzers vary in design rather than principle. They are all of the cell-type with a wide range in size and weight according to desired capacity. They accommodate membranes that range in surface area from less than a thousand square centimeters as used in the laboratory, through twenty thousand square centimeters as in the complicated and cumbersome artificial kidney[1] used in large hospital centers, to hundreds of thousands of square centimeters in the massive apparatus used in industry to salvage raw materials and to recover usable by-products.[2,3] New models are put on the market from time to time, but the consulting engineer specifying this type of equipment for his client can only select from among the several manufacturers. He has no real choice in principle of design and operation.

Membrane Effectiveness

To increase the rate of dialysis, the manufacturers and their product designers have concentrated on increasing the membrane surface area rather than on improving the effectiveness of the membrane as a separator. As a result, the rate of dialysis is slow per unit area of membrane, and large and costly apparatus is required for industrial appli-

cations. In the clinic, there has been an urgent need for an inexpensive and effective dialyzer of small size that is simple to assemble and operate.

It was this clinical demand that stimulated the effort to increase the efficient use of the membrane and led to the development of a new artificial kidney.[4,5] The new dialyzer now has fulfilled rigid clinical requirements and is used successfully in this country and abroad.[6] It now seems that this same new approach to dialysis can be used by consulting engineers in designing and specifying for industrial applications.

Principles and Objectives

Although there are no accepted standards for use in measuring the effectiveness of a dialyzer, with all factors constant the rate of dialysis per unit area of membrane should be an appropriate unit of measure. On this basis, accumulated data from the laboratory and clinical use of the new dialyzer over a period of several years proves it to be much more effective than older types.

In fact, when a dialyzing membrane is used in its most effective manner, dialysis is not a slow process at all, and even for handling industrial volumes it need not be massive or complicated.

The new dialyzer design calls for a coil of semipermeable membrane tubing held in the path of a cascading shower by an internal stainless steel wire support. The wire support is rubber-coated to prevent injury to the membrane. The component parts of a small dialyzer unit are shown in Fig. 1.

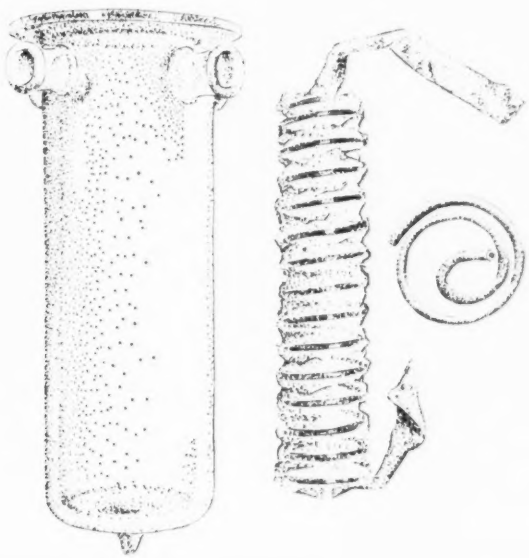


Fig. 1—Medical dialyzer is of simple construction. Component parts are chamber, coil, and disperser.

These parts are: (1) disperser, (2) coil with semipermeable membrane tubing, and (3) chamber to contain these elements. The coil in this model is 9-in. high and has a 2¾-in. pitch diameter and an 11/16-in. pitch.

When the coil and disperser are placed in the chamber, the wash fluid is made to flow through the confined, tortuous membrane, which induces a turbulent flow. The solution, containing the dialyzable material, flows through the disperser which causes the solution to disperse and cascade over the exterior wall of the tubing. In this manner, only a thin veil of solution is dialyzed at any one time, and the concentration of dialyzable material directly on the membrane barrier is always at its maximum. This thin film exposure, combined with the turbulent wash fluid flow, reduces the resistance to diffusion flow to a minimum.

The Variables

There are numerous factors that influence the rate of molecular transfer across a membrane wall. Some of these factors are: character of the membrane (its thickness, number of pores per unit area, and pore size), molecular and ionic charges of the solute, electrical potential across the membrane, pH of the solutions, diffusion coefficients, molecular size and shape, temperature of the solutions, and the relative concentration of the solute on one side and the dialyzate on the opposite side of the membrane wall.

Of the known factors that are common and constant to nonviable membrane systems, the variable factor for increased capacity would relate to the degree of solute concentration on opposite sides of the membrance wall, or the concentration gradient. Dialyzable material diffuses from the region of high concentration through the membrane pore to the region of lower concentration. The rate of dialysis is maximum initially, but it falls rapidly and progressively as the solute concentration approaches equilibrium on both sides of the membrane. Optimum rate of dialysis will be maintained and the most effective use of the membrane will occur when a maximum concentration gradient exists and is constant across the membrane.

Concentrations

Ideally, the material being dialyzed should be renewed an infinite number of times on one side of the membrane to provide a maximum concentration, and the wash fluid should be renewed an infinite number of times on the other side of the membrane to provide a zero concentration.

Means should be provided to eliminate insofar as possible the effect of the inherent resistance of solutions to molecular diffusion. Diffusion in

solutions is very slow and delays the conveyance of the solute to and from the membrane. The delay increases in direct proportion with the length of the molecular path. Diffusion through a thin semipermeable membrane is relatively immediate and occurs only with those molecules in physical contact with the membrane. As dialysis proceeds, these molecules are replaced slowly by the molecules diffusing from areas of higher concentration and more distant to the membrane. This impedance to dialysis is reduced by shortening the molecular path.

Ideally, the dialyzable material should contact the membrane with a molecular thickness. The dialyzer need only contain that amount of solution that is in actual contact with the membrane. On the opposite side of the membrane, it is necessary to remove the solute from the membrane. Ideally, this is accomplished by immediate dissolving of the solute or dialyzate and immediate removal of the resultant solution.

Stagnation of fluids should be reduced to a minimum. When a fluid flows in the laminar range, the film barrier that characteristically forms on the contacting surface becomes an additional resistance to molecular diffusion. The barrier is reduced by inducing turbulence in the flow stream.

Analogy to Thermal Conductance

The effect of these factors on the rate of dialysis can be demonstrated in an analogy to the laws of thermal conductivity as described by Fick's law of diffusion through liquids.[2,7] By this analogy, the quantity of material diffusing per unit time is proportional to the area and to the concentration gradient in the direction of diffusion, and the proportionality factor is the over-all coefficient of dialysis. This proportion is further described as: $W = UA\ (\Delta C_m)$ where W is the weight of material passing through the membrane in grams per minute, U is the over-all dialysis coefficient in centimeters per minute, A is the membrane area in square centimeters, and ΔC_m is the logarithmic mean concentration gradient across the membrane in grams per cubic centimeter.

As a further illustration, Fig. 2 graphically represents a cross section of diffusion flow through a composite medium. The arrow

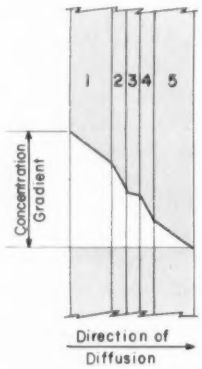


Fig. 2—Concentration gradiant in diffusion through components of a cell-type dialyzer. Sections 3 and 4 are film barriers.

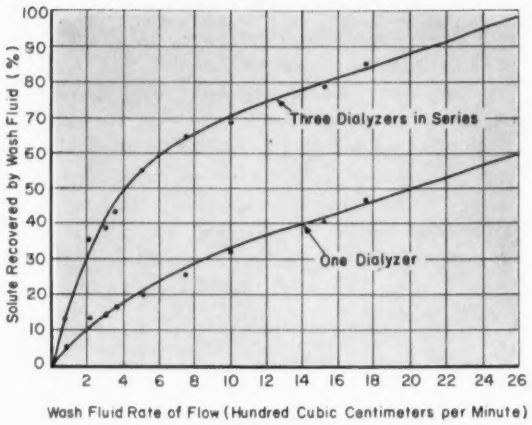


Fig. 3—Recovery of solute by wash fluid with the new dialyzer. (The initial concentration of the urea-water solution is 315 mg per 100 cc. Solution rate of flow is constant at 300 cc per minute.)

gives the direction of dialysis. A solute contained in solution (1), dialyzing through a semipermeable membrane, (3), into a wash fluid (5) which is of lower concentration, first would have to overcome the resistance of its own solution. Additional resistance to diffusion flow is encountered because of the film barriers (2) and (4), which form on each side of the semipermeable membrane as a result of the combined forces of adhesion and cohesion in addition to other factors. Any decrease in the resistance to diffusion, such as shortening the molecular path, will cause a correspondingly increase of the over-all dialysis coefficient. Elimination of that resistance will increase the coefficient to a greater extent.

Performance of the New Dialyzer

The laboratory tests demonstrated by the graphs of Figs. 3 and 4 were made with the new dialyzer in its clinical model. Two concentric and parallel dialyzer coils with a total of 4000 square centimeters were used. Both coils were 9 in. high, and one coil of 3½-in. pitch diameter was placed over an inner coil of 2¼-in. pitch diameter. The wash fluid flowed through each of these coils in parallel.

This arrangement was used to compensate for the inaccuracy of the disperser which disperses the solution over the dialyzer coil. When one coil is used, some of the soultion splashes away from the coil. Although it is well within the convenience of the apparatus to provide this second coil, a more accurate disperser would eliminate the need for it. The double coil arrangement, however, provides a very high safety margin, and therefore satisfies an important requirement for a clinical dialyzer.

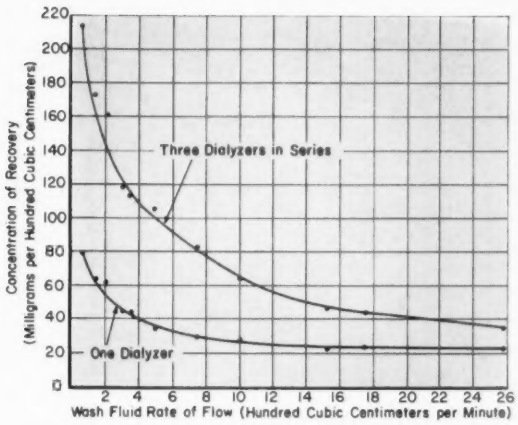

Concentration of Recovery
(Milligrams per Hundred Cubic Centimeters)
Three Dialyzers in Series
One Dialyzer
Wash Fluid Rate of Flow (Hundred Cubic Centimeters per Minute)

Fig. 4—Recovered solute concentration increases as units are put in series. (Initial concentration of the urea-water solution is 315 mg per 100 cc; solution flow rate constant at 300 cc per minute.)

The size of the new dialyzer was chosen primarily to make the apparatus convenient for clinical use. As a clinical dialyzer, the heart of the patient is the sole propagating force. A taller apparatus would impose a higher hydrostatic head. Alternately, if a smaller size dialyzer coil is used, larger amounts of wash fluid would be necessary in order to compensate for the decreased height.

Test Parameters

All the laboratory test outlined by these graphs were made with a chemical solution of urea-water with a concentration of 0.315 grams per 100 cc. The rate of flow of solution was constant at 300 cc (about 3 quarts) per minute at 40 C. Tap water at 33 C was used for the wash fluid, and its rate of flow was increased every half hour when urea samples were taken at the end of the half-hour period. A single batch of 99 liters of urea-water solution was treated without recirculation. The wash fluid was made to flow counter in direction to the cascading flow of the solution in order to obtain the greatest mean concentration difference between the two mediums and the most effective use of the surface area.

Seamless regenerated cellulose tubing (viscose process) was used as the semipermeable membrane. Its inflated diameter was 23/32 inches with a wall thickness of 0.0010 inches and average pore diameter of 48 angstrom units.

Fig. 3 describes the effect of increasing the wash fluid rate of flow and the subsequent removal of the dialyzable material (urea). As the wash fluid rate of flow is increased, the removal of urea from its solution also increases. The curves also show how removal of a solute is increased when three dialyzers of clinical size are placed in series as compared with one dialyzer. With this procedure a greater capacity is obtained for the same amount of wash fluid. In each instance the graph departs from the vertical line thus demonstrating the change in the over-all coefficient of dialysis. As the flow of wash fluid increases, larger amounts of solute diffuse through the semipermeable membrane to mix with the wash fluid. When the wash fluid flow increases into the higher turbulent range, this mixing or diffusion becomes more immediate, bringing about a reduced change in the over-all coefficient of dialysis. This is made evident by the straightening out of the graphs in the higher wash fluid flow range.

Fig. 4 is similar to Fig. 3 except that the recovery of solute was measured in terms of its concentration in the wash fluid. Similarly, this concentration is increased in the use of three clinical dialyzers in series as compared to one. Figs. 3 and 4 also demonstrate the way a required recovery and its concentration can be predetermined, and show how the necessary number of dialyzer units placed in series fulfills this requirement.

In order to demonstrate the consistent characteristic of the new dialyzer, a graph (Fig. 5) was made for a six-hour period. The rate of flow of solution and wash fluid were held constant throughout this dialysis period. It is shown that the rate of diffusion throughout the six-hour period is practically unchanged.

On the other hand, in a dialyzer of cell-type construction, the rate of diffusion cannot be expected to be constant throughout a substantial

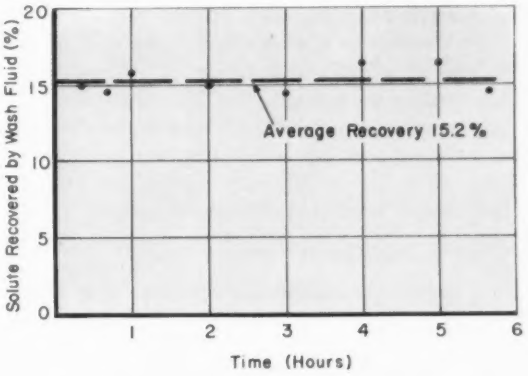


Fig. 5—One of the important characteristics of the new dialyzer is its constant rate of dialysis. (Data based on one dialyzer. Initial concentration of urea-water solution—240 mg per 100 cc. Solution flow rate about 308 cc per minute. Wash fluid flow rate constant at about 246 cc per minute.)

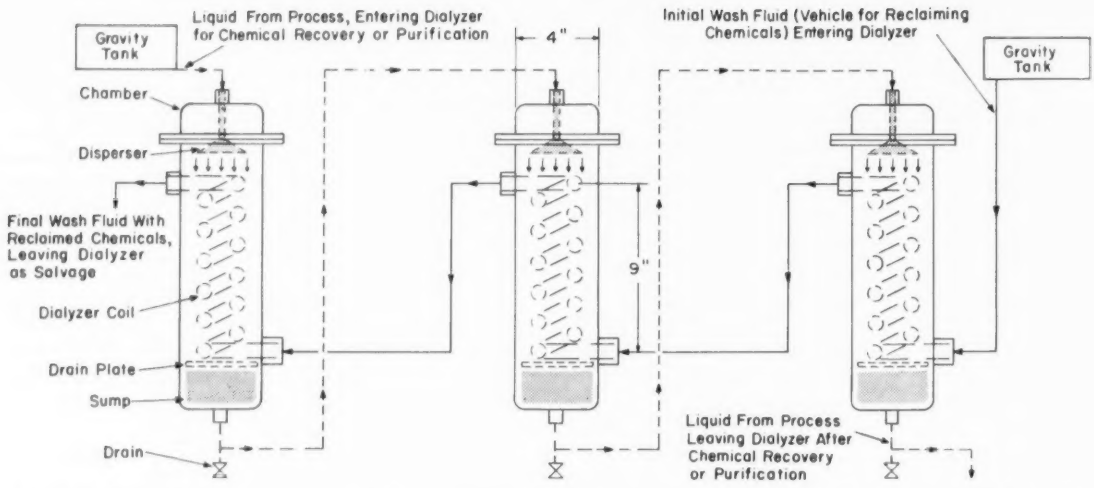


Fig. 6—The new dialyzer arranged for continuous reclaiming of industrial chemicals and purifying of solutions. The pneumatic cushion formed in the chamber by the process liquid moves the liquid to the adjacent chamber, eliminating need for transfer pumps. An alternate method would place units in a vertical column.

period. While cell arrangement may show impressive results at the beginning of dialysis, these are sharply reduced as dialysis continues. This condition is especially true if the fluids are moving in a viscous or laminar flow range.

Comparative Data

The test for the data in Fig. 5 was conducted with a urea-water solution with a concentration of 0.240 grams per 100 cc as compared with 0.315 grams for Figs. 3 and 4. The solution rate of flow was constant at 308 cc per minute and 37 C. Tap water was used as the wash fluid at a constant rate of 246 cc per minute and 37C. Although the concentration of the solution was lower, a fair comparison can be made with the curves of Fig. 3.

The manner in which the membrane is supported and the principles applied permit a very convenient and inexpensive method whereby a thin-walled, pliable, noncorrosive membrane may be used as both a dialyzing surface, and a heat-transmitting surface. This feature provides means for excellent temperature control of the solution when required.

Wide Application

The apparatus described permits a very broad range of application. Solutions may be passed through the dialyzer in very small or large amounts. The maximum solution rate of flow that may be used depends upon the accuracy of dispersing the solution over the dialyzer coil. During laboratory trials there have been occasions to use solution rates of flow as high as 900 cc per minute, and the results were within the characteristics shown on the graphs. There were no indications that this flow is the maximum the apparatus can accommodate.

The data outlined in Figs. 3 and 4 serve as an index of what may be expected from a dialyzer coil of the size described. The capacity can be increased simply by increasing the pitch diameter of the coil to allow a higher fluid rate of flow through it and a wider dispersal of solution over the coil. Smaller amounts of wash fluid will be required for the same percent extraction when the dialyzer coils are greater in height.

Removal of Salt

A good example of what may be expected from the use of a dialyzer coil of the size shown may be demonstrated in the removal of sodium chloride from an aqueous solution. This process is directly related to the preparation of milk for human consumption as part of a salt-free diet.

Since sodium chloride will diffuse at approximately the same rate as urea, a reference to Fig. 3 will show that about 92 percent of the solute can be removed at a wash fluid flow rate of 2200 cc per minute, when the solution flow rate is 300 cc per minute and three of the basic size coils are placed in series. A suggested arrangement is shown in Fig. 6 which was used in the development of the data presented. An alternate method would be to place the units in a vertical column. This same arrangement can have a higher yield by using larger coils. An apparatus of the type shown in Fig. 6 can be had at an approximate price of $500.

When dialysis is applied in the recovery of a solute, the recovery sometimes must be of suffi-

cient concentration in order to be practical. This is typical in the rayon industry where the job is to recover the caustic soda at a predetermined concentration. When a particular recovery concentration is preferred, the wash fluid flow rate must run in proper ratio to the solution flow rate. For example, if the initial concentration of a solution is 18.5 percent and it is required that 90 percent of the solute be recovered at 8 percent concentration, then the wash fluid flow rate must be approximately two times the solution flow rate.

A Typical Industrial Process

Caustic soda will diffuse 20 to 50 percent faster than urea. Also, caustic soda has a detrimental effect on cellophane which makes the substitution of another material necessary. The substitute membrane could be parchment paper of similar characteristics. The data outlined in Fig. 3 is based on a solution flow rate of 300 cc per minute, therefore, a proportionate wash fluid flow rate would be approximately 600 cc per minute in order to achieve the required recovery concentration. If the solution flow rate is 1100 cc per minute, then the wash fluid flow rate should be approximately 2200 cc per minute for the same percent extraction.

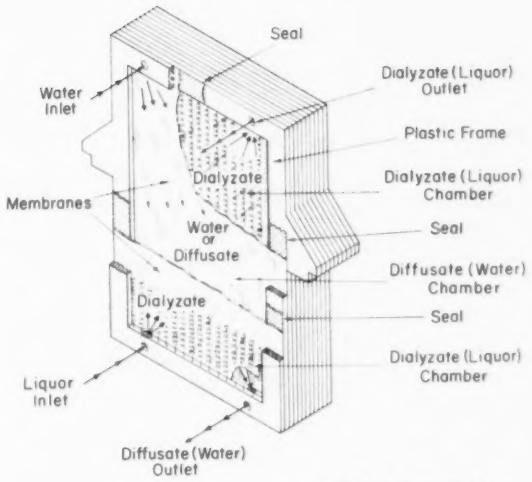
Dialysis now may be carried on through a successive number of basic units until 90 percent of the solute is recovered. Since caustic soda will diffuse at least 20 percent faster than urea, it can be seen that a series of six basic dialyzer coils would be necessary in order to obtain a 90 percent recovery at 8 percent concentration when the initial solution concentration is 18.5 percent.

The examples illustrate each of the two methods by which the new dialyzer may be used. In the first instance a solute is removed as a waste product, and in the second instance a recovery of a solute is achieved at a predetermined concentration. In each, the removal or recovery of a solute is attained in an economic and convenient manner.

Gaseous Diffusion

Purification of various solutions, salvage of waste materials, selective filtration of solutes, and the extraction of vitamins can be obtained in the same manner. Each of these processes can be conducted at carefully controlled temperatures.

The same principles outlined for the diffusion of molecules in a liquid state apply as well to molecules in a gaseous state. The pneumatic cushion that is formed in the chamber provides a medium through which a gaseous exchange of the solution can be effected. By attaching a gas absorbing vehicle, such as lime water, to a vent in the chamber, carbon dioxide will be removed from the solution. This same method can be applied in the removal of other gases from solutions or in the detoxification of offensive wastes. When it is necessary that solutions be treated in an oxygen-free atmosphere, the pneumatic cushion can be formed of an inert gas.



Graver Water Conditioning Co.

Commercially available dialyzer of filter press design has alternate liquid and water cells, with each cell separated by a semipermeable membrane.

Economical Distiller

The inherent effectiveness of the membrane surface area suggests its use as an economical distillation method. One of the important advantages is the application of an inexpensive, noncorrosive membrane material with a thin wall that is simple to replace. This minimizes the usual and serious problems that are caused by corrosive fluids. Basic tests, made with aqueous solutions of high saline content, indicate a strong possibility that these solutions can be handled more economically in the manner described than by any of the conventional methods. ▲▲

Bibliography

1. Merrill, J. P., et al, *Journal of Clinical Investigation*, 29, 412 (1950).

2. Perry, J. H., *Chemical Engineers Handbook*, Third Edition 753-756.

3. Eynon, D. J., *Journal of Society Chemical Industries*, 52, 173t (1933).

4. Guarino, J. R. and L. J., "An Artificial Kidney–A Simplified Apparatus," *Science*, 115, 285-288 March 14, 1952.

5. Harrison, T. R., et al, *Year Book of Medicine*, (1952).

6. Guarino, J. R., "Development and Clinical Use of the New and Simplified Artificial Kidney," Medico-Military Symposium, Combined Armed Forces, Brooke Army Medical Center, Fort Sam Houston, San Antonio, Texas, May 21, 1954.

7. Clark, W. M., *Topics in Physical Chemistry*, (1948).

A. W. PEABODY
Ebasco Services Inc.

A. W. Peabody received a B.S. degree in Electrical Engineering from the University of Maine in 1937. He joined Ebasco Services Incorporated immediately following graduation and, except for a leave of absence for military service, has been with the firm ever since. Peabody has been a specialist in corrosion control since 1939. He has been concerned with surveys, designs, construction supervision, and adjustment of corrosion installations for transmission and distribution piping systems as well as for underground cable systems and electric generating station facilities. He is a registered professional engineer in New York and a member of the National Association of Corrosion Engineers, AIEE, and NSPE.

Pipe in Concrete Need Not Corrode

IT CAN BE more than discouraging to have prepared the plans and specifications for a major radiant heating installation, watched it go in and perform entirely as expected – and then have it develop leaks after a year or two of operation. Since repair of leaks in radiant heating piping laid under a concrete floor slab usually require extensive breaking up of finished surfaces, owners can be understandably annoyed at those who are responsible for the design of the installation.

There is no mystery connected with the type of corrosion normally experienced on these installations, and there are good reasons that some systems start leaking within a short time whereas others operate indefinitely without a sign of trouble.

Installation in Concrete

Some engineers have doubts regarding the wisdom of installing radiant heating systems in concrete. They feel that there are some unknown factors involved in this problem of corrosion. If, however, these doubtful engineers understood why severe corrosion occurs with certain designs, and if they knew what provisions could be included in a design to make it essentially corrosion free, they could design this type of heating system with assurance that there would be no early corrosion failures to inconvenience the owner and embarrass the designer.

The usual cause of rapid corrosion of steel radiant heating piping installed under concrete is the use of a type of construction that creates conditions favorable to the formation of strong galvanic corrosion cells at the pipe surface. The particular type of cell ordinarily is referred to as a concentration cell. In its usual form, a cell is established if a metallic structure is in contact with an electrically conducting electrolyte having variations in concentration or composition.

Voltage Differentials

There is almost always some measurable electric voltage between a metal object such as a pipe and an electrically conducting environment such as soil or wet concrete. The magnitude of this voltage will be different for different degrees of concentration or for differences in composition of the electrolyte in the environment. It follows, then, that where these differences exist there will be detectable voltage differentials between the environment adjacent to the pipe at one spot and the environment adjacent to the pipe at other spots. This is illustrated diagrammatically in Fig. 1, which goes on to show that these voltage differences result in a flow of current between points of difference in the electrolyte, with the pipe serving as a return path to complete an electrical circuit.

At points where current flows to the pipe, there is no detrimental action so far as the pipe metal is concerned. At points where current leaves the pipe, however, the electrochemical reaction is such that metallic ions leave the metal surface to enter the surrounding electrolyte where they combine with free ions present to form some compound of the metal – normally a hydroxide. In steel pipe these reactions result in pitting and formation of rust.

The rapidity with which corrosion occurs is a function of the amount of current being discharged

from the metal surface per unit area. The amount of current is, in turn, a function of: (1) the voltage differences, which tend to force the current to flow through the corrosion circuit, and (2) resistance of the circuit, which tends to restrict the flow. In the usual corrosion cell the amount of current flowing is seldom more than a few thousandths of an ampere. The milliamp is a commonly used unit in corrosion work. One milliamp is a very small amount of current (about 350 milliamps are required to operate an ordinary flashlight), but even one milliamp is not to be taken lightly when dealing with corrosion.

Steel discharging direct current into an electrolyte normally will be consumed at a rate that is based on the electrochemical equivalent of iron. This is approximately 0.02 pounds per milliamp per year. This does not sound like much, but if this one milliamp of corrosion current is concentrated in small areas, the 0.02 pounds of metal lost could show up as eleven ¼-in. diameter holes through the walls of standard one-in. steel pipe.

A Common Mistake

With the cause of corrosion in mind, shortcomings in design provisions are more readily apparent. The common mistake is the obvious one. It results from the simplicity of laying the radiant heating pipes directly on a base layer of sand, earth, vermiculite, or other similar material and then covering the piping with poured concrete. This results in a condition, as shown in Fig. 2, where the major part of the heating pipe surface is enclosed by the poured concrete while the relatively small remaining surface area is in contact with the soil or vermiculite base layer. The voltage between concrete and steel is sufficiently different from that between soil or vermiculite and steel to set up a flow of corrosive current. The direction of the current flow is such that the steel contacting the soil or vermiculite is corroded. This is the reason leaks in piping installed in this manner usually are found on the bottom of the pipe.

The accompanying photograph was taken at a three year old radiant heating installation where sections of the piping were being exposed for the repair of leaks. The heating piping had been laid on a pad of vermiculite prior to pouring the top slab. Examination of the photograph shows the junction between the concrete slab and the vermiculite layer as well as the fact that the piping is located at this junction line in a manner that will bring about rapid corrosion. Trouble was experienced with this installation wherever moisture reached the vermiculite.

It is clear, then, that the prime requirement for a suitable design is that the liquid-carrying steel

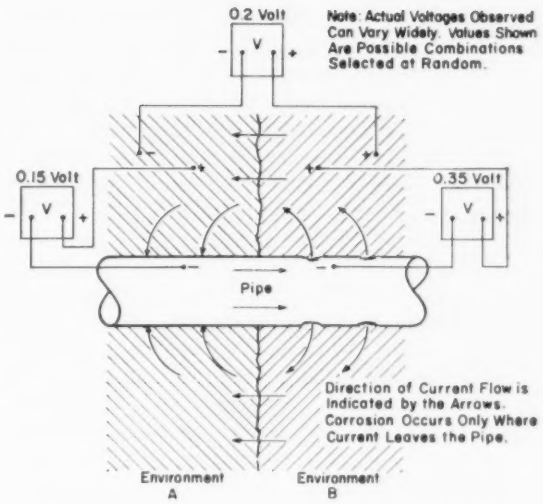

0.2 Volt
V
Note: Actual Voltages Observed Can Vary Widely. Values Shown Are Possible Combinations Selected at Random.
0.15 Volt
V
0.35 Volt
V
Pipe
Direction of Current Flow is Indicated by the Arrows. Corrosion Occurs Only Where Current Leaves the Pipe.
Environment A
Environment B

Fig. 1—Illustration of corrosion caused by dissimilarities in surrounding conducting environment.

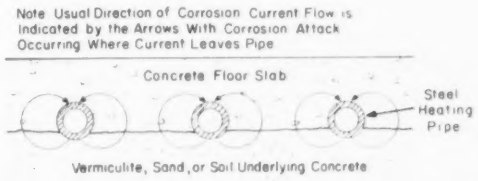

Note: Usual Direction of Corrosion Current Flow is Indicated by the Arrows With Corrosion Attack Occurring Where Current Leaves Pipe
Concrete Floor Slab
Steel Heating Pipe
Vermiculite, Sand, or Soil Underlying Concrete

Fig. 2 — Pipes will corrode even if only a small portion is not totally encased in the concrete.

Radiant heating piping exposed for repair of corrosion leaks. At slab edge, note contact between the pipes and vermiculite (dark in color) below.

heating pipes be totally enclosed in the concrete slab. If this condition is fulfilled, the pipes will be essentially free of external corrosion, provided good concrete is used and the slab remains intact. No active corrosion cells would be established as long as the uniform environment of sound concrete remains unchanged. Even though there might be surface conditions on the steel pipe that would lead to corrosion if the pipe were immersed in soil or water, the effect of these conditions is stifled by the uniform alkaline environment (good for steel) plus the lack of free access to water and oxygen — both of which are needed for continuation of an active corrosion process.

The inference is that good concrete work is needed. In fact, if any of the concrete breaks away from the steel pipe surface allowing a substantial contact with water, soil, or other underlying material, the pipe surface exposed will be subject to rapid corrosion. This is not necessarily true of hairline cracks which, if the concrete envelope is of sufficient thickness, are not free channels of access for water and oxygen.

Pipe Supports

What means may be used to ensure that all the heating pipes are properly surrounded by the concrete of the slab? The obvious solution is to support the pipes on small concrete blocks that will become a part of the poured slab. These blocks should not be large. However, they should be sufficient in number to provide proper support for the steel piping above the underlying material so that, after the slab is poured, the pipes will be surrounded by a concrete envelope having a minimum thickness of one inch. Prior to pouring the slab the concrete support blocks should be thoroughly wet down with water in order that the bond between these blocks and the slab will be as tight as possible.

Perhaps an even more satisfactory means of supporting the pipes is the use of saddles or chairs fabricated of galvanized or plain steel wire or rod. These should be formed and installed so that the pipes will be covered by a minimum concrete thickness of one inch. The steel used in the support devices will be partially enclosed in the slab and partially in contact with the underlying material. In accordance with what has been said, that part of the support below the slab will corrode and in time can be expected to be completely severed. This will be of no consequence, as further need of the supports ends after the poured slab has set.

Assuming that suitable concrete has been used, there will be little tendency for corrosion to progress along the support wire or rod and eventually reach the heating pipe. This has been confirmed by many examples in the field where reinforcing rods left protruding from concrete have corroded at the outer edge. But inside the concrete the rods remained in as-new condition after many years.

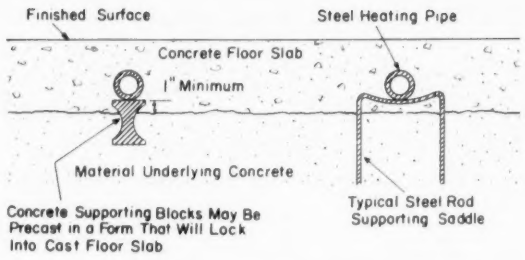

Finished Surface
Steel Heating Pipe
Concrete Floor Slab
1" Minimum
Material Underlying Concrete
Concrete Supporting Blocks May Be Precast in a Form That Will Lock Into Cast Floor Slab
Typical Steel Rod Supporting Saddle

Fig. 3 — Two methods of supporting heating pipes to ensure complete encasement in the floor slab.

Pipe supports can be shaped and installed in general accordance with the detail shown in Fig. 3. This sketch also diagrammatically illustrates the use of concrete blocks.

Wooden blocks must not be used for supporting the heating pipes. Conditions would be similar to those shown in Fig. 2 where part of the heating pipe would be in contact with concrete and part in contact with a dissimilar material. In the presence of moisture transmitted to the surface of the pipe by the wooden blocks, corrosion of the pipe in contact with the wood would occur. Any deterioration of the wood with time could result in an acidic condition at the contacting pipe surface, which would result in even more intense corrosion.

Earlier mention was made of the necessity for having good concrete completely surrounding the steel heating pipes. This simply means good structural concrete compounded of Portland cement, sand, gravel, and satisfactorily pure fresh water — but without special additives that might promote corrosion. Some additives, particularly those used for freeze prevention, can cause corrosion of the steel enclosed by the concrete containing the additive. If the additive-caused corrosion continues until the concrete is split or sloughed away by accumulation of corrosion products, free entrance of water will further accelerate the corrosive action.

Aggregate Size is Important

The size of the aggregate used in the floor slab concrete should be taken into consideration. If the thickness of concrete below the heating pipes is to be one inch, and if one inch aggregate is used, it is conceivable that there might be difficulty in obtaining full coverage without voids or honeycombing along the underside of the pipes. Even if there were no voids initially, there would be instances in which a thin cement film would be the only barrier between the pipe and the underlying soil or

other material. These films would be subject to rupture under expansion and contraction stresses. To forestall difficulties of this type, it is desirable to have the maximum aggregate particle size one-half inch less than the thickness of concrete below the underside of the heating pipes.

The importance of adequate inspection during installation cannot be overstressed. There have been projects where the design called for supports for the heating pipes that should have insured their being completely enclosed in the concrete slab. During construction, however, the material underlying the floor slab was not evenly graded so that contacts occurred between it and the heating pipes. Within a few years leaks developed and the slab had to be broken up.

The Circulating Medium

Internal corrosion problems are seldom significant in radiant heating systems using water as the circulating medium. However, the water should be fresh with a reasonably low total solids content – preferably less than about 100 ppm. The less dissolved oxygen present in the water the better. The water may be deaerated if necessary, but often the dissolved oxygen content is sufficiently low so that it is used up quickly during initial superficial corrosion. Once the available oxygen is consumed, further corrosion essentially is stifled. The secret is to use a completely closed system with as little replenishment of water as possible. Corrosion inhibitors also may be desirable or necessary when poor water must be used in the heating pipes or when unusual operating circumstances dictate.

Cathodic Protection

Consideration also should be given to the question of what can be done for those systems that have been poorly installed. Unfortunately, the cure is usually difficult and expensive and may require replacement of the entire slab and piping system.

Where it can be used, cathodic protection is a satisfactory solution although installation can be expensive, and the design of a system for cast-in-slab pipes can be complex. Best results are obtained with anodes distributed underneath the slab in a suitable design pattern to permit unimpeded flow of the protective current from the anodes to exposed portions of the radiant heating pipes on the underside of the slab. This applies to either galvanic anode systems, where applicable, or impressed current systems using rectifiers or some other d-c supply as a current source.

The design can be expected to involve an appreciable amount of slab cutting in order to install the anodes and the necessary wiring. For reasonable assurance of success, such an installation should be engineered carefully, and tests should be made at the site, to determine characteristics of the soil underlying the slab and the current requirements. Only in this way can the type of system (galvanic anodes or impressed current) and the most favorable anode configuration be determined.

Cathodic protection is practical only where there is sufficient room and a suitable environment under the floor slab to install the necessary anodes. Radiant heating system piping has been known to corrode even in upper floor slabs or ramps where there were only a few inches of vermiculite or sand between the surface slab and the underlying supporting concrete. Corrosion under such conditions is not corrected readily at reasonable cost with cathodic protection. The installation cost easily could be as great as for complete replacement of the floor slab and heating pipes.

Heating to Drive Out Moisture

Since there must be moisture in the material in direct contact with the steel heating pipes if corrosion is to continue, it is probable that the greater part of the aggravated corrosive attack occurs during the periods when the system is out of service. This would indicate that a possible method of preventing corrosion would be to keep enough heat in the system to maintain all material in contact with the pipes in a dry condition.

Using heat obviously would be expensive and would be undesirable if the floor slab continued to radiate heat when not needed. In addition, there always would be a question as to whether enough heat actually was being applied to keep the immediate pipe environment dry. This would vary from installation to installation and would depend on the quantity of moisture and the pressure behind it. If the heat were not sufficient to maintain a completely dry layer around the pipes, the corrosion cells would be encouraged by a warm electrolyte. The rate of corrosion in warm electrolytes is appreciably faster than in cool ones, so if heat is used to prevent corrosion, it must be sufficient to dry rather than just warm the material around the pipes, otherwise there would be even more rapid corrosion than if no heat at all were used.

Once the underlying reasons are understood, it is easy to see how a seemingly inconsequential change in location of the steel radiant heating pipes can have such a pronounced effect on the corrosion resistance of the system. It is unfortunate that many have had to learn this the hard way – particularly since corrective measures on a corroding system are expensive. But if the simple precautions described here are observed, designers can expect their radiant heating systems to give extremely long and trouble-free service. ▲▲

Pan American's 72,000-sq ft terminal building at New York International Airport has a curtain of air entrance.

Where to Use a Curtain of Air

WALTER NORTON
Tippetts-Abbott-McCarthy-Stratton

Walter Norton currently is serving as head of the Mechanical Engineering Department at Tippetts-Abbett-McCarthy-Stratton. His professional career also includes experience as a safety engineer with Travelers Insurance Company and as a project engineer with the Carrier Corporation. For some ten years before joining Tippetts-Abbett-McCarthy-Stratton, Norton conducted his own practice as a consulting engineer and during this period also served as Adjunct Professor of Mechanical Engineering at the College of Engineering of N. Y. U.

IN THE EARLY planning stages of New York International Airport's Pan American Terminal, in 1957, it was decided that conventional doors ought to be replaced with some type of entrance that would facilitate passenger traffic. Passengers arriving at the terminal should have a clear view of the interior, and be able to proceed without hesitation to the least crowded check-in counter.

CE exclusive

Various types of doors were considered and discarded as not meeting the requirements. Moreover, with conventional doors, vestibules would be needed to prevent cold drafts in the building when the doors were open.

Faster, Safer

Airline passengers generally are accompanied by children, baggage, or impedimenta of one sort or another. Thus, it was thought that the elimination of doors and door frames would result in faster traffic flow and would reduce the incidence of accidents at the entrance.

Consideration at first was given to an open entrance 100-ft wide with the interior of the build-

ing pressurized through the air conditioning system. It was found that an air movement of 600,000 cfm would be required across the opening to withstand wind pressures at the entrance. The suggestion was made that outside air be introduced through the air conditioning system, filtered, heated or cooled, and introduced into the concourse, where it would build up pressure and force its way out the entrance to counteract wind pressures.

This idea had to be abandoned, however, for the cost of introducing 600,000 cfm of outside air through the air conditioning system, to maintain pressure across the entrance (where only 90,000 cfm was required for ventilation, exhaust, and pressurization), would have been exorbitant. Moreover, a flow of air of this order could certainly have resulted in drafty conditions in the concourse.

Curtain of Air Concept

In the winter of 1952, one of our engineers, returning from Athens, Greece to the New York Office, stopped at Zurich, Switzerland, and there saw one of the early successful applications of a curtain of air in the Oscar Weber Department Store. He described this entrance to the architectural and engineering design groups at Tippetts-Abbett-McCarthy-Stratton; it was presented to Pan American Airways; and the decision was reached that a full study should be made of the curtain of air for the entrance to the new terminal at Idlewild.

Using a curtain of air to prevent drafts at entrances is not a new idea, we found. In 1904, Theophilus Van Kennel applied for the first patent for an air curtain to seal an entrance from the outside weather. Van Kennel described his invention as a device wherein air is introduced from both sides of an entrance through nozzles to counteract wind forces blowing in through the entrance. The width of the entrance sealed by Van Kennel's installation was rather small. So far as we know this curtain of air never was built. However, Van Kennel's entrance was, in principle, the forerunner of the modern curtain of air.

Many Approaches

Other inventors also studied the problem. In 1916 Caldwell, an American, introduced his application – blowing air through nozzles above the entrance of a building with a floor grating to receive the air on the suction side. The floor grating was made in two parts; cold outside air was drawn in by the outer half of the grating and blown through ductwork to the outside of the building. Warm air introduced through the nozzles above the entrance was drawn in by the inner part of the floor grating and introduced to the interior of the building.

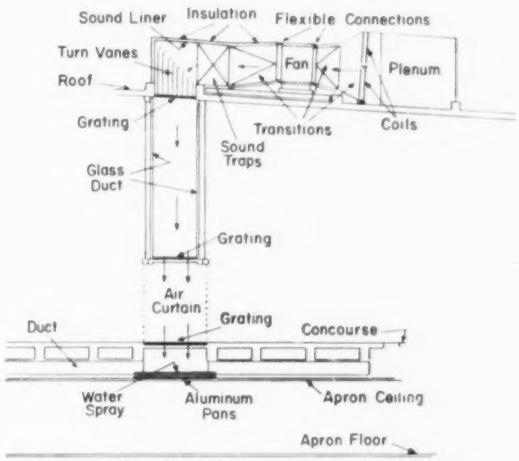
There were other applications from 1916 to 1952, using jets of air to blow flies and dirt from cattle at barn entrances, and air screens were used to separate the theater stage with its high intensity floodlights and heat from the orchestra. None of these was particularly successful. They relied on a thin stream of air, generally using single velocity and usually without a suitable means for varying the air discharge across the width of the opening in the building.

The Bon Marche' Department Store in Brussels had a curtain of air installed in 1951. Strangely, there is no record of the inventor.

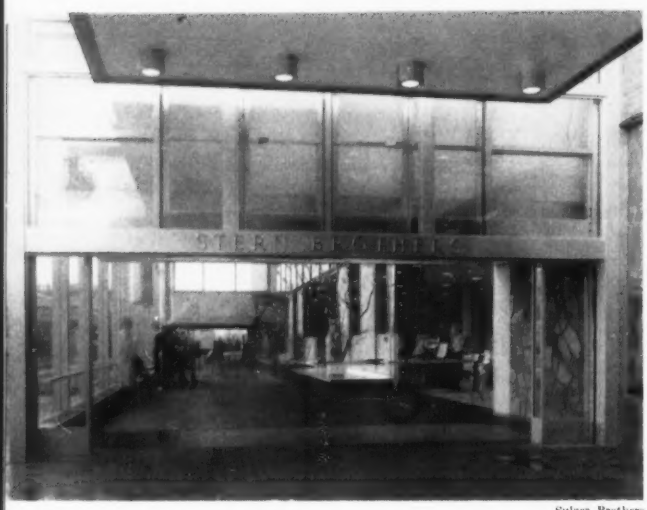
Successful Installations

It was in 1952 that Sifrag, of Berne, Switzerland developed the practical curtain of air for the entrance to the Oscar Weber Department Store. In that same year Sulzer Brothers installed a curtain for their factory in Winterthur, Switzerland. Since then both firms and their licensed representatives, American Air Curtain and Sulzer Brothers of America, have installed curtains of air throughout the country. The widest entrance is at Harrah's Club in Reno, Nevada – 41 feet in width, and the highest is at the General Electric Company in Lynn, Massachusetts – 18 feet in height. A more recent American manufacturer of the curtain of air is Air Door Inc., of New Castle, Indiana.

Today one can walk through doorless entrances in department stores, supermarkets, banks, office buildings, night clubs, and factories. These entrances provide unobstructed access from the street to the interior of the building. Walking through such an entrance, one may notice a gentle breeze and find oneself in a warm interior which seems to be open to the cold outside air. The curtain of



Air curtain in Pan American terminal is coupled to roof-mounted equipment with glass ductwork.



Sulzer Brothers

Nothing here in the way of the shopper in a hurry. Installation illustrated is at Stern's, in Paramus, N. J.

air forms the invisible barrier between the inside and outside of the building.

Theory of the Method

The first reaction of most of my engineering confreres, and I must admit mine too, to the curtain of air concept was that it largely involved the application of known theory. On investigation, however, we found that despite the great amount of work done by ASHAE and others on air distribution, there is nothing in the technical journals on curtain of air design, which is essentially a complete air recirculation cycle.

The purpose of the curtain is to prevent, by means of a jetted air stream at the entrance, outside winds from entering the building. The air supplied then is recaptured at the re-entry grating at the floor, returned to the system, filtered and heated or cooled, and returned to the jets for reuse.

Air Stream Opposes Wind Pressure

The horizontal component of the jetted air stream is employed to offset the wind pressure from the outside. Depending on the force of the outside wind, the air either is drawn back into the re-entry section after accomplishing its purpose, or upon increase in outside wind force over the design jetted velocities is spilled back into the building. As the interior is pressurized, the air pressure within reacts against the air pressure without. When the wind pressure increases, so does the interior pressure. It is important, therefore, in buildings that are not tight to give consideration to air escaping through openings thereby causing the air curtain to break. This is particularly true in tall buildings where there is a stack effect.

Design Considerations

Although packaged curtains can be purchased, each building entrance should be analyzed by the engineer before preparing the design and specifications. Building height, interior and exterior design temperatures, stack effect, wind velocities and prevailing directions, adjacent buildings and their influence on air pressure at the entrance, and the building configuration – all must be investigated.*

Most curtain of air installations are designed with night closure doors although some that operate 24 hours a day have no closure at all. Where hurricanes and gale winds are encountered occasionally, supplementary closures should be used.

Jetted supply air velocities for comfort applications should not exceed about 1200 fpm at the comfort zone, but industrial applications can go much higher.

Pan American Terminal

Our design work on the Pan American Terminal will serve as a good example of the engineering involved in a major curtain of air installation. The terminal building is predominantly glass enclosed, approximately 600-ft long and 120-ft wide. Over the building and forming the main roof there is an elliptical canopy approximately four acres in area which extends out beyond the building lines to protect passengers from the elements when boarding or leaving the aircraft. The canopy is steel and reinforced concrete, independently supported by steel cables and peripheral reinforced concrete piers. There are six tension columns at the center of the structure.

Ramps from the incoming roadway from the city lead to the concourse, or second level. Just ahead of the entrance, wind screens are installed for the full width at the front and at both sides to reduce the effect of northerly winds.

Wind Tunnel Tests

It was apparent that the very long roof overhang at the entrance, although serving to protect passengers from the weather, also would act to build up pressure in the event of high winds. We decided that a model of the terminal should be tested by Sulzer Brothers in the wind tunnel at the Federal Institute of Technology, in Zurich. Over 100 tests were made to determine whether modifications to

*An article entitled "Designing a Jet Terminal," by Walther Prokosch, AIA, Partner, Tippetts-Abbett-McCarthy-Stratton, scheduled for publication soon, contains information that will be of interest to designers.

the building design would be required, and indeed whether the curtain of air was feasible.

After analyzing the results the front screen was increased slightly in width, and the two side screens were increased in height. Openings were provided through skylights in the roof in front of the entrance to permit the release of excessive air pressures ahead of the air curtain. With these modifications, we found that comfort velocities of curtain air could contain the air pressures of strong northerly winds.

Now that the installation of a curtain of air had been found to be functionally possible, we had the problem of incorporating it into the architecture of the building. The curtain handles 600,000 cfm of air, so space limitations are important. The engineer is faced with limitations on all jobs, but those at Pan American taxed the ingenuity and patience of all – engineers and architects.

Both the air curtain supply duct, 89-ft long, and the return ducts at each side of the entrance are constructed of glass, as are the other three walls. This carries through the scheme of opening the concourse to the view of the public.

The space available for return ductwork on the ceiling below the concourse is limited, and because of the high water table at Idlewild, the apron level floor slab could not be lowered without considerable waterproofing expense. Moreover, trucks that have unloaded baggage from planes must enter the building from the exterior apron.

The building height is limited by sight lines from the control tower. Operators in the tower must be able to see every plane at any time, no matter where it is located. In addition to height limitations, the building width could not be extended, because of the space required for movement of aircraft and trucks on the apron ramp.

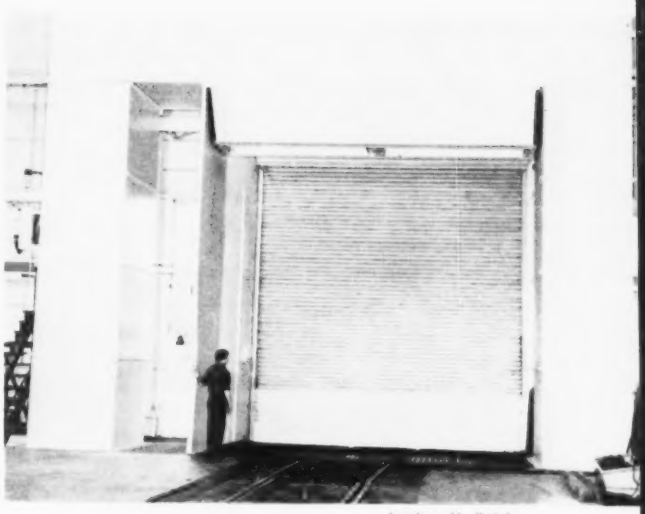
The apron level ceiling, in addition to carrying return ducts for the curtain of air, has steel members and mechanical and electrical ducts and pipes.

As a result of all these space limitations, we found that with the quantities of air to be handled we were exceeding the velocities critical both to static pressure and noise level.

At one point, the installation of three separate curtains rather than one single curtain of air was considered. Fans, coils, and filters were to be housed at the 12-ft level across the entrance; gratings at the floor would return air to six vertical glass ducts spaced at equal intervals across the entrance.

This system would have been less expensive than the single curtain of air across the full width, but the installation of vertical ducts across the entrance would not have allowed a clear view of the interior of the terminal. This could not be tolerated.

We all have known seemingly impossible jobs that were conquered – and this is another one. But it required a co-operative effort.



American Air Curtain

Air curtain entrance at GE West Lynn, Mass. plant is 18-ft high, 20-ft wide. Night door is shown closed

¶ The structural engineers resized and rearranged the steel members.

¶ The architects eliminated ornate grilles, which were producing excessive friction. The extension of turn vanes resulted in a pleasing grille effect at floor level.

¶ The electrical and lighting engineers revamped runs of conduit and redesigned the lighting.

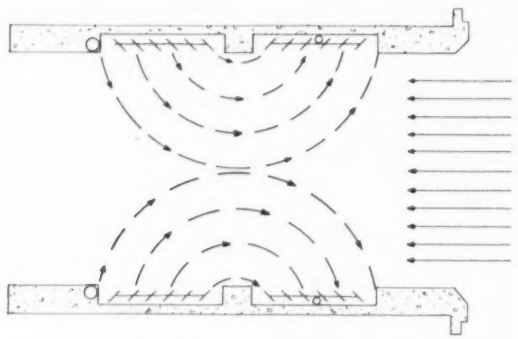
¶ The mechanical group changed air distribution and duct and piping runs to favor the air curtain duct sizes and velocities.

In this way the curtain of air became possible.

Equipment Arrangement

Six, 100,000-cfm fans, each designed to operate at 3-in. wg static pressure and each driven by 75-hp electric motors, were installed on the roof. The fans as well as air louvers at the entrance adjust automatically in section to respond to varying wind pressures across the 89-ft opening. Depending on wind direction, a higher pressure may be had at one section of the entrance than at others. In addition, as wind velocity changes, the speed of the fans and the angle of throw of the outlet louvers change automatically.

Cleanable type filters and heating coils are installed in an aluminum housing on the roof. Leaving the roof fans, the air passes through acoustical traps and then down to discharge at the entrance. A return grating at the floor acts as a re-entry for the air. Below this grating is a stainless steel pan with sprays to keep the pan wetted. This traps and



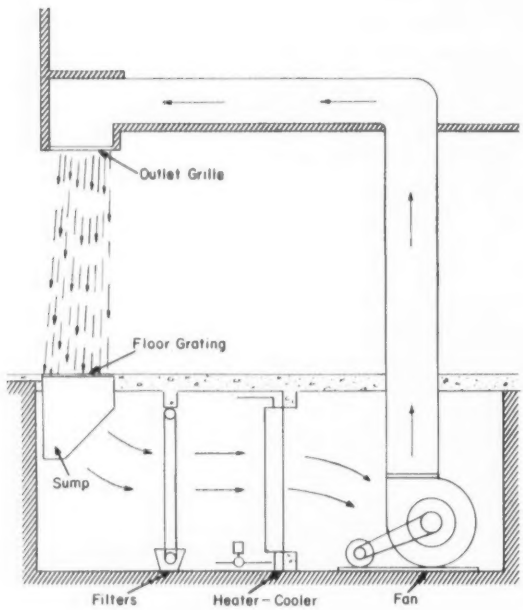
Plan view of the predecessor of today's doorless door, described in a patent application in 1904.

washes away dirt that may be pulled in at the floor.

Experience with installed air curtains showed that heels on ladies' shoes were being broken off. Gratings with 9/32-in. openings are too large, so our specifications called for 7/32-in. openings. So far we are ahead of the ladies' shoe designers, but the trend to narrower heels bears watching.

Pressure Loss Problem

A further consideration was loss of pressure in the interior of the building. To reduce stack effect and to serve as a cushion to outside wind forces, any building using an air curtain should be pressurized.



Equipment configuration and the direction of air flow for a typical curtain of air installation.

There are eight exits from the concourse through which passengers move toward the departing planes, and small vestibules of glass were installed at these exits to reduce loss of air pressure.

On the mezzanine level, which appears as a platform floating in the concourse, there is a restaurant and kitchen. The restaurant and kitchen must be provided with conditioned air, and the kitchen hoods must be exhausted. One of our criteria was that no ductwork or piping should appear between the level of the mezzanine and the canopy roof above. Therefore, all exhaust ductwork was carried down below the mezzanine floor and up in the tension columns, discharging above the roof.

In addition, considerable air leaks from the concourse down through the stairway to the apron lobby and out through the apron vestibule, and at the sides of the lobby are doors through which passengers' baggage is brought in from the planes by means of small trucks.

All of these constitute a loss of pressure from the interior of the concourse.

Studies were made of the air flows required for air conditioning in comparison to those required for pressurization. It was found that outside air in excess of that normally required for air conditioning of the huge terminal building would be needed for pressurization.

System Also Air Conditions Aircraft

Consideration then was given to the fact that aircraft stationed on the apron outside of the building require air conditioning. Heretofore, aircraft have been air conditioned by mobile equipment, which constitutes an interference to aircraft on the field, or through the use of pits sunk below the apron level in which the air conditioning equipment is housed but which tend to collect quantities of hazardous fuel vapors.

We decided to take the excess air at the normal 76 F and 50 percent relative humidity and further cool it to the required aircraft dewpoint by means of air conditioning equipment within the building. It then is pumped through underground ducts at high velocity to the various plane positions, using an adaptation of the aircraft fueling system connector for delivering the air to the plane.

A study of the demand frequency of aircraft flights at the Pan American Terminal indicated that no burden will be placed on the curtain of air and its back-up system of pressurization as a result of this design addition.

Economics of the Method

While this terminal installation is a large and interesting one, the air curtain entrance is attractive for many types of buildings. Sulzer Brothers of

America (the contractor for the curtain of air at Pan American Terminal) report that 50 percent of all curtain of air installations by them in 1958 were for banks. Generally, the installation of the curtain of air will pay for itself in savings by freeing valuable floor space near the entrance previously taken up by vestibules, eliminating door and glass maintenance and repairs, eliminating accidents at the entrance, lowering cleaning costs, and perhaps reducing the heating fuel costs.

The installed costs of a curtain of air normally vary between $750 and $2000 per foot of entrance width. Operating costs – including electricity for the fans and steam or hot water for tempering the air – were found to average $0.50 per hour for an entrance 10-ft wide by 7-ft 6-in. high. Each installation must be studied by the engineer to see if there are savings in fuel when the curtain of air is used throughout the year.

Applications

The curtain of air has value wherever heavy traffic is encountered. This would include railroad, bus, and airport terminals; theaters; churches; banks; hotels; restaurants; and public buildings such as schools, hospitals, and post offices. Among industrial and commercial applications are loading and receiving warehouses, garages, service stations, firehouses, and factory entrances – particularly entrances that normally require frequent opening and closing of heavy doors.

In addition to curtains at entrances, air can be employed to close off areas within a building which are at different atmospheric conditions, but which have considerable traffic between them. Air conditioned production areas can be separated from storage areas that are not air conditioned. The curtain of air will seal off a paint spray booth or a baking oven and still allow a continuous conveyor line to operate. A new application, gaining favorable attention, is in cold storage spaces and walk-in freezers. One interesting fact about the curtain of air is that flies and insects cannot pass through it. Food packaging, canning, and bottling plants should find this interesting.

Fire Safety

An important application would be for entrances to places of public assembly. Many fire deaths have been attributed to disastrous pile up of panic stricken people at door entrances. The Coconut Grove fire was responsible for the deaths of 498 people. A majority of these deaths resulted from panic. If, instead of doors at the entrance, there had been one clear opening, panic still might have occurred but there would not have been a bottleneck at the doors to seal the crowd in the building

Here is something revolutionary in the field of safety and fire protection engineering. Insurance companies and underwriters should be aware of the safety features inherent in the curtain of air. Reduction of fire and public liability rates for these structures where the curtain of air is used can be expected to follow.

Future Uses

Here are some other thoughts on possible future applications of a curtain of air.

The shelter building for the Bomarc (a pilotless missile that seeks out and destroys enemy planes or missiles) is a concrete box 18-ft wide by 65-ft long, topped by a steel roof. The roof is split down the middle so the halves can be rolled to either side when the missile is launched. Shelters are maintained at 60 to 90 F and 50 percent relative humidity.

Instead of opening the roof for launching the missiles, a horizontal jet of air could form a barrier preventing rain, sleet, snow, or dirt from entering while allowing the missile to leave without delay.

Here in this country, we are not too accustomed to outdoor restaurants – perhaps we have no time to linger – and because of the cold in our northern climate, outdoor restaurants are not comfortable for almost six months of the year. If, however, a curtain of air were installed across the front, the outdoor restaurant could be popular, both during the summer and winter seasons.

From this we perceive that solariums, hothouses, enclosed gardens, and swimming pools using the horizontally jetted curtain of air could be designed. Roof gardens could be used on hotels, restaurants and clubs, eliminating the roof structure and opening the dining area to the skies.

Bombproof Shelters

Bombproof shelters are subject to chemical warfare. A curtain of air would provide an effective screen at all entrances and exits, capturing chemical gases and treating them in filtration media. Here, again, we have safety features for crowds.

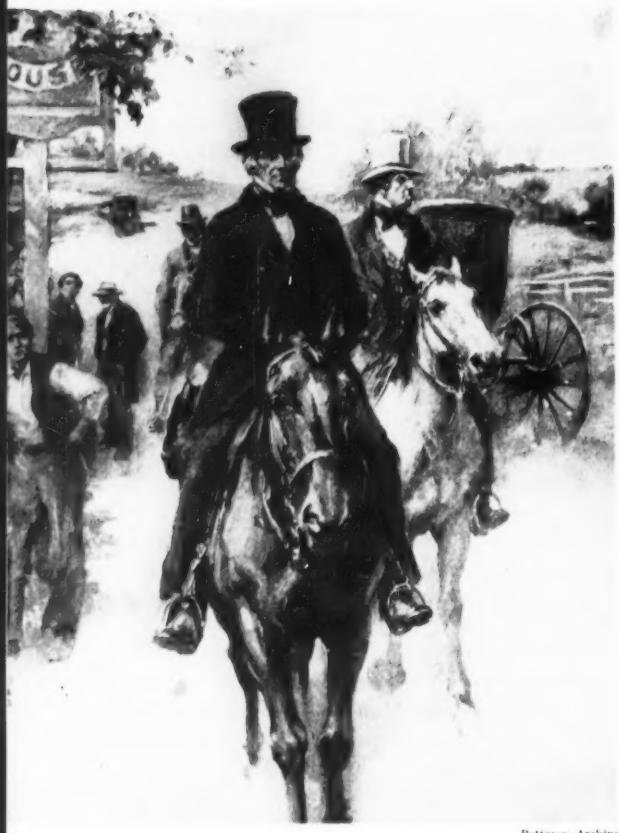
In chemical plants where hazardous or toxic fumes occur in one section, a curtain of air could be used to separate that section from others. All fumes which escape could be caught in the curtain and treated.

In hospitals, science labs, and indeed in the separation of sterile from nonsterile areas, the curtain would provide a barrier, trapping germs and destroying them in the filtering section of the system. The elimination of doors and door handles certainly would eliminate much transfer by contact.

There are many other logical applications awaiting only the ingenuity of the designer. ▲▲

America Moved West on The Old National Road

TOM PROBST



Bettman Archive

Henry Clay, U.S. statesman and orator, on the National Road.

"S" BRIDGE
Old National Road
Built about 1828
Where the road crossed a creek at an angle, a stone arch bridge was built at right angles to the stream flow. "S" shaped walls were then built to guide traffic around the jog from the direction of travel across the bridge and back onto the road line. An arch parallel with the stream flow and in line with the road would have been more difficult and costly to build.

DURING THE UNITED STATES' first 50 years, our government's most important civil engineering project was the National Road, which linked the newly settled lands in the west to the established states along the Atlantic seaboard. Completed at a cost of $7 million, it ran 700 miles from the Potomac almost to the Mississippi and carried a stream of settlers who boosted the western population fivefold in a generation.

Before the Road was built many people thought the Appalachian mountains were a natural barrier to further westward growth of the United States. They thought the 4-million square miles beyond the mountains would form a separate country, divided from the 13 original states as Italy and France are separated by the Alps. The only question, they felt, was whether these ultramontane territories would be independent or controlled by France, England, or Spain. All three nations had well-defined spheres of influence in the region, and the Kentucky territory was involved in every one of the power's plans and counterplans.

The people in the western areas were none too eager to join the United States, for they had few ties with the East. Many settlers desired a union with Spain because their natural outlet for trade was the Mississippi, and New Orleans was held by the Spanish. Of the three powers in the new world, Spain would make the fewest demands on the settlers; an alliance with Spain would be an easy relationship, far different from the meddling to be expected if they threw in with France or England, who were continually warring with each other and with the Indians.

The Cavernous West

Men spoke of going into the west in those days much as one speaks of going into a cave. It was an apt simile. The west was dark, forbidding, wild, dangerous. Men went west to hunt and trade, not to settle, and they followed the buffalo trails across

the mountains. These buffalo trails were the fastest and most direct routes to feeding grounds and salt licks. The buffalo, weighing 1000 pounds each and covering as much as 200 miles a day, pounded these trails pavement-hard, wide, smooth.

Before the white hunters came, the main trails ran north-south. The movement was south during the winter, not because of the cold (the buffalo's shaggy coats could easily withstand below-zero weather) but because the feeding grounds were covered with snow. As hunters slaughtered their way west, the buffalo's seasonal migration changed from north-south to east-west. Driven west by hunters in summer, the buffalo returned to the forested east in the winter.

Three Main Routes West

Three established buffalo trails crossed the Appalachians. In the north, the trail ran across upstate New York to what is now the City of Buffalo on the Great Lakes. Today this is the route of the New York Central Railroad. The second route ran southwest between the Allegheny and Blue Ridge mountains, then turned west through the Cumberland gap into *Ken-ta-kee*. Daniel Boone marked this trail in 1774, and it became known as the Wilderness Road. In Kentucky the buffalo trail split; one route led to Lexington and the Blue Grass country; the other went through what is today Louisville and thence to the site of St. Louis on the Mississippi.

The third route went from the upper Potomac through Pennsylvania to the Ohio River where Pittsburgh now stands. George Washington traveled this route when he went to Fort Le Boeuf carrying Dinwiddie's warning to the French not to fortify the region; he traveled it again with Braddock's army in 1755 when it was defeated 7 miles from Fort Duquesne (Pittsburgh).

Richard Sanders Allen

The only covered span across the Ohio river, Wheeling Bridge was a very important link of the National Road.

For 60 years after Braddock's defeat the route was impassable in winter and impossible in summer. But the growing importance of Fort Pitt and the Ohio territory made improvement a necessity.

Need for the Road

The government had reasons for wanting a good road west – to colonize the Northwest Territory and the Louisiana Purchase lands. By settling these regions the United States could remove a constant threat to its security.

The wars with England and the Indians had shown the young government how essential it was to have good roads through the territories. Communications alone made it hard to control armies in the forests. And troops were likely to starve, not because the government could not provide for them, but because there was no way to get supplies to them rapidly and steadily.

By 1800 settlers were pouring over the Wilderness Road to the states of Kentucky and Tennessee. Others struck across Pennsylvania to the Youghiogheny river, floated down past the Golden Triangle to the Ohio River, and settled in Ohio, Indiana, Illinois, and Missouri. The west was filling up.

Planning

The National Road was the idea of Albert Gallatin, a "clear-headed Swiss" with "judgment and capacity" who was President Thomas Jefferson's secretary of the treasury. Gallatin strongly favored a policy of internal improvements paid for by the central government. At first Jefferson demurred, wanting a constitutional amendment before using

Richard Sanders Allen

Famed covered "Y" bridge at Zanesville, Ohio on the National Road. It carried traffic from 1832 to 1901.

Bettman Archive

Stagecoach and Conestoga wagon in front of a country inn typical of those found on the National Road. Scene was painted by A. Curand.

national funds for local purposes. He finally agreed, however, that the National Road would be financed by selling public lands in territories it would serve.

In 1802, Congress passed enabling legislation so the people in Ohio could form a state. The law provided that five percent of the net proceeds from the sale of public lands in Ohio would be earmarked to build a National Road to the territory.

This question of using national funds for an interstate highway seems academic today, but then the United States was little more than a decade old, and there were strong feelings about the central government getting too powerful.

Highway Commissioners

To pick the optimum route, Congress authorized Jefferson to appoint three commissioners. It was required of them only that the route should touch the Ohio river in the west, and a navigable river emptying into the Atlantic in the east. The Ohio river was selected for two reasons: first, it was contiguous with the state of Ohio and second, it was the one major river that could help westward migration. Nearly all other major rivers west of the Appalachians run north-south.

Gallatin shrewdly left appointment of the three commissioners to Jefferson, for Gallatin had been accused of promoting the National Road to enhance the value of some farmland he owned in Pennsylvania. Having the Road pass on or near one's property was like having a gold mine in the backyard; a tavern or inn could make one rich.

The commissioners, according to the act of Congress, "shall each receive $4 per day for their compensation, including all expenses. And they are hereby authorized to employ one surveyor, two chainmen, and one marker . . . to attend them in laying out said road, who shall receive, including all expenses, the surveyor, $3 per day, and each chainman and marker, $1 per day, while they shall be employed in said business.

"All parts of the road, in case the trees are standing, shall be cleared the whole width of four rods; and the road shall be raised in the middle of the carriageway with stone, earth, or gravel or sand, or a combination of some or all of them, leaving or making, as the case may be, a ditch or water course on each side and contiguous to said carriageway, and in no instance shall there be an elevation in said road, when finished, greater than an angle of five degrees with the horizon."

In their 1806 report the commissioners said the Road should follow the trail of Washington's and Braddock's armies, starting at Cumberland, Maryland, on the banks of the Potomac river, wind through Pennsylvania toward Pittsburgh, but turn, bypassing the city, and terminate at Wheeling, Virginia (now West Virginia) on the Ohio.

Road Under Construction

The next year, the commissioners reported that timber and brush had been cleared and contracts signed for building the first 10 miles west of Cumberland. Ten years later the section between Cumberland and Uniontown, Pennsylvania was complete, and contracts had been let for the stretch between Washington, Pennsylvania, and the Virginia border. The next year the mail was carried

Toll rates were graduated according to wear on the Road, much as today's tolls are established. This toll house was near Frostburg, Md.

Bettman Archive

on a regular basis between the cities of Washington, D.C. and Wheeling.

The Road was more expensive than anticipated. In their original report, the commissioners estimated the project would cost $6000 a mile, excluding bridges. But the section between Cumberland and Uniontown cost $9745 a mile, and when the Road reached Wheeling the average cost was $13,000 a mile. Part of these overcharges came from unforeseen delays and expenses, for the Road passed through rugged mountainous country. But much of the extra cost came from carelessness and fraud. Army engineers, who supervised construction of the Road, pointed out eight ways contractors made extra money, including altering the gradient, failing to break stones, delivering less material than agreed, and collecting twice for what was delivered once.

In 1820 Congress authorized $141,000 to finish the Road to Wheeling and made a second grant to lay out the Road between Wheeling and a point on the Mississippi between Saint Louis and the mouth of the Illinois river. This hushed fears that the Road would stop at Wheeling, though for many years travelers had to cross the Ohio by boat. No bridge was built until 1836, and that crossed only the west channel. The east channel was bridged in 1849, but a storm destroyed the 1010-ft suspension bridge five years later.

Heavy Traffic

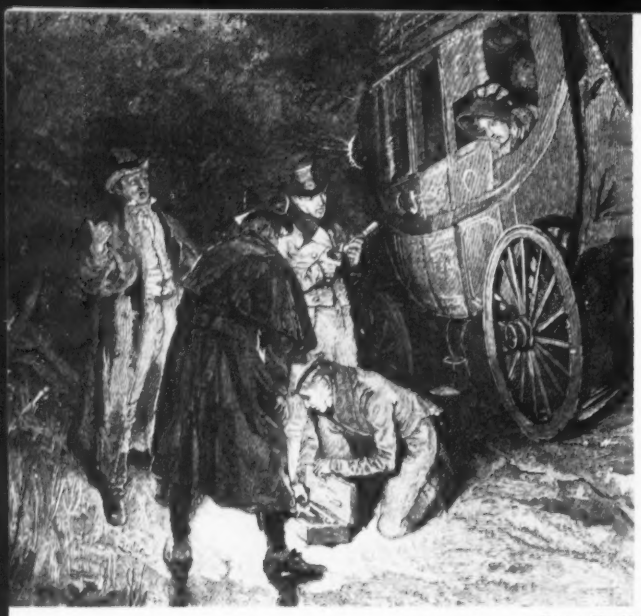
As soon as the Road was opened it was thronged. Cabins turned into taverns, fords became bridges. Small wagons and great mountain ships creaked along it, while fast "shakeguts" expresses raced past them. Gypsies, minstrels, jugglers, traders, peddlers, soldiers, showmen, and beggars threaded through the army of settlers moving westward. The sheer volume of people and goods moved was tremendous. In 1822 a single Wheeling commission house unloaded 1100 wagons averaging 3500 pounds each and paid $90,000 in freight.

Maintenance

After a few years of this, the Road was in poor condition in many places. To provide for upkeep and repair, Congress passed a bill (1822) authorizing the government to set up tollgates on the Road. This President James Monroe vetoed. He believed the government had no right to assert jurisdiction over the land the National Road was built on, for it belonged to the individual states. Two years later, however, Monroe signed a similar bill, and in 1825 he authorized repair work on the Road in Ohio and Indiana.

The repairs were extensive. To make the Road permanent, the old pavement was broken up and stones removed. Then the 30-ft wide roadbed was raked smooth and given a 3-in. crown.

Stones were broken to a 4-ounce size, spread on the bed, then raked. No clay or sand could be mixed with these stones which were laid in 3-in. deep sections. When a section was laid, it was opened to traffic for a time, then closed and another layer added. Traffic periodically was re-routed so all parts of the Road got equal wear. The deepest roadbed was not more than 9 inches; generally 6 inches was sufficient. Only limestone, granite,



Harpers Monthly

Nighttime travelers along the National Road had to have their wits about them and flints in their pistols.

or flint was used for covering and none was put on until the lower layers were compacted.

Ditches and drains were dug along either side and culverts cleaned out and repaired. Where culverts were impractical, drains or paved catchwaters crossed the Road, but they were gently sloped so wagons could cross without trouble. Roadbanks were strengthened at these points so there would be no danger of the roadbed washing away in a heavy storm.

Masonry for culverts, sidewalls, and bridges was of "good quality," with "plenty of mortar and no clay." Hydraulic mortar was not placed after October of any year, and all foundations were well pointed, down to 18 inches.

Construction in Ohio

The original aim of the Road was to serve the early population centers in Ohio – Cincinnati and Chillicothe – but by 1825 the central and northern parts of the state were rapidly filling up, so the Road was routed through Zanesville, Columbus, and Springfield. The only route restrictions on the Road were that it should go due west, passing through the capitals of Ohio (Columbus), Indiana (Indianapolis), and Illinois (Vandalia).

An advertisement for bid proposals on the Ohio section read:

"National Road in Ohio – Notice to contractors. Proposals will be received until the 19th of August inst., for clearing and grubbing eight miles of the line of National Road . . . west of Columbus.

"The trees and growth to be entirely cleared away to the distance of 40 feet on each side of the central axis of the road, and all trees impending over the space to be cut down; all stumps and roots to be carefully grubbed out to the distance of 20 feet on each side of the axis, and where occasional high embankments, or spacious side drains may be required, the grubbing is to extend to the distance of 30 feet on each side of the same axis. All the timber, brush, stumps and roots to be entirely removed from the above space of 80 feet in width and the earth excavated in grubbing, to be thrown back into the hollows formed by removing the stumps and roots.

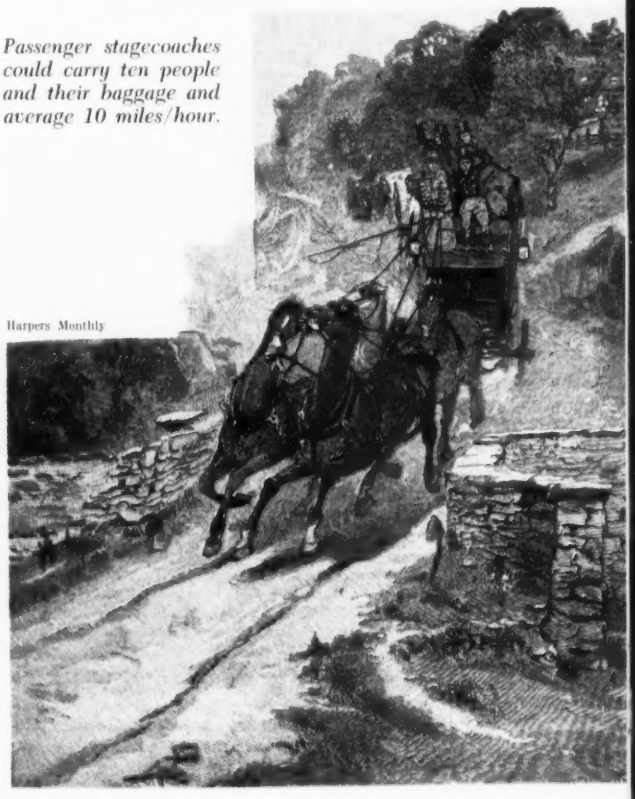
"The proposals will state the price per linear rod or mile, and the offers of competent, or responsible individuals only will be accepted."

By 1833 the Road was completed between Columbus and Zanesville; in 1837 survey parties pushed across the Indiana state line; 1850 saw the Road completed in Indiana.

Competition in Travel

As the Road grew longer, it became less important. The reason for this apparent paradox is that alternate forms of transportation were now available. When the Road was started, settlers could travel only by wagon, animal, or on foot. Ten years after the Road had been started in Pennsylvania, there

Passenger stagecoaches could carry ten people and their baggage and average 10 miles/hour.



Harpers Monthly

Bettman Archive

Innkeepers prospered during Road's early years. This was Fair View Inn in 1827, the three miles from Baltimore.

was a canal route to the Ohio, with a railroad bridging the portage between Harrisburg and Pittsburgh. By the time the Road was completed to Wheeling, there were packet boats on the Ohio to carry the settlers farther west. When the Road reached Indiana, railroads and canals were competing for travelers.

The onslaught of the railways was so great Congress considered substituting a railroad for the National Road from Columbus to the Mississippi. Railroad proponents argued that a railroad would be cheaper to construct, cheaper to maintain, and would provide faster transportation. But Congress appropriated $600,000 to run the Road to Vandalia, though it was to be bridged and graded only. This was finished in 1852.

As the Road was completed, it was turned over to the states. To pay for the necessary repairs, the states set up their own tollgates, posted where the public could see them.

Toll Rates

It is interesting to compare the toll charges with the fees for driving on the Pennsylvania, Ohio, and Indiana turnpikes today. The 1831 toll schedule for Pennsylvania varied from 4 cents for a horse and rider, to 9 cents for a sled and pair of horses, and up to 18 cents for a "chariot, coach, coachee, stage, wagon, phaeton, chaise" with four horses.

Rates were determined by the wear on the Road. Narrow wheels rutted and grooved the Road, while wide wheels almost acted as rollers, so the wider the tread, the less the toll.

Tolls varied by state, those established in Ohio running 50 to 100 percent higher than in Pennsylvania. The next year (1832) Ohio slashed its tolls, bringing them in line with Pennsylvania's.

People making long trips on the National Road could pay all tolls in advance, getting a toll certificate to show each gatekeeper. No tolls were charged people going to church, muster, business, funeral, mill, election, or trading center in their county. School children, clergymen, mail, U.S. property, and soldiers also passed free.

Enforcement Precise

Since the mail went free, one enterprising Pennsylvania stage line put a sack of mail on every stagecoach, arguing that the gatekeepers would have to pass the mail (and therefore the stagecoach and passengers) free. In a court test of this philosophy the decision was that the mail went through free, but passengers had to pay.

Stage companies were charged for each passenger. If a driver refused to let the gatekeeper check the stage, the keeper charged for the maximum number of people the stage could hold.

The states set stiff penalties for damaging the Road. Breaking or defacing milestones, culverts, parapet walls, or bridges could be punished by fines of $500 and imprisonment on bread and water for 30 days, or both. Penalties were established for letting drains get obstructed, premature travel on an unfinished roadbed, letting a wagon stand overnight on the Road, and traveling with locked wheels except when icing conditions made it necessary.

Stagecoaches and Inns

Traveling was a neighborly affair four generations ago. At night inns were thronged with people and during the day the Road was crowded with stages and teams, people, cattle and sheep, and horsemen.

Stages were operated by private companies, much as railroads are today. At first there were a number of small companies which fed into the routes of the larger stage companies. As competition grew fiercer, these smaller lines either sold out to their

competitors or were forced into losing fare battles.

Trade wars were fought by adding extra routes, boosting the speed, and lowering fares, which usually averaged 4 cents a mile. One war between the National Road Stage Company and the Good Intent Line slashed a $5 fare to 50 cents.

Stagecoaches were painted in brilliant colors and even gilded, with interiors lined in silk plush to match. Exterior panels were decorated with paintings of landscapes and portraits of famous men. They were named for prominent men and women, states, ships, and countries (there was even an *Erin Go Bragh*).

Nine passengers could ride inside the coach, with a tenth perched up beside the driver. During good weather this outside seat was much prized. Roofs were rounded on early coaches, but were flat on later ones to carry baggage. The body was suspended on thoroughbraces – "springs" made of a dozen thicknesses of leather.

Wagons and Drivers

The first wagons using the National Road were the same type used in eastern cities. Their narrow wheels were well suited to the cobblestones of town streets, but sank in the soft ground and gravel of the National Road. Because of this, and because tolls were lower for wagons with wider treads (those with treads over 6 inches went free in Ohio), large wagons with wide wheels soon became dominant.

The drivers usually had particular runs and knew every dip and bend in the road. They had fierce contests trying to better each other's times. Speeds often averaged 10 miles an hour. The record was held by Homer Westover who raced the 20 miles between Uniontown and Brownsville at nearly 30 miles an hour. The passengers remembered the bruising trip for a long time. For greater speed, horses were waiting at each stage. The team could be changed in a minute or so, the driver never leaving his seat.

At least one driver found it hard to leave his seat even at the end of his run. Montgomery Demming weighed 465 pounds in his prime, but he let himself go to pieces and weighed 650 when he died. He started with the June Bug Line and then switched to the Express Line. Something about Demming's appearance as the coach bounced over the Road soon caused wags to christen it the "Shake Guts Line."

Though the drivers were well paid, they grumbled about the price of cigars. One enterprising manufacturer made up some cheap and foul-smelling cigars tailored especially for them. Selling four for 1 cent, these were called "Conestoga cigars" after the name of the wagons. This gradually changed to "conestogies" and soon was shortened to "stogies."

Mail Service

The most important official use of the National Road was for United States mail. The post office department contracted with stagecoach companies on an annual basis for mail delivery between cities. The mail coaches were a good deal faster than the regular coaches. For example, the mail express went from Washington to Indianapolis in 2 days 17 hours, while passenger stages took nearly 7 days.

The mail on the National Road went to the south and southwest territories. Service to Chicago and Detroit went on poorer roads. When the Great Lakes froze over, northwestern Ohio, Michigan, Wisconsin, and northern Illinois and Indiana were almost isolated until spring.

Because the mails were the only means of communication, their arrival was a time of excitement. Delays seldom developed because of the National Road, for weather had little effect on its surface, but usually were caused by post office snarls, stagecoach breakdowns, or ice and snow. Until the bridge across the Ohio river at Wheeling was built in 1849, coaches often were held there for days waiting for the ice to go out.

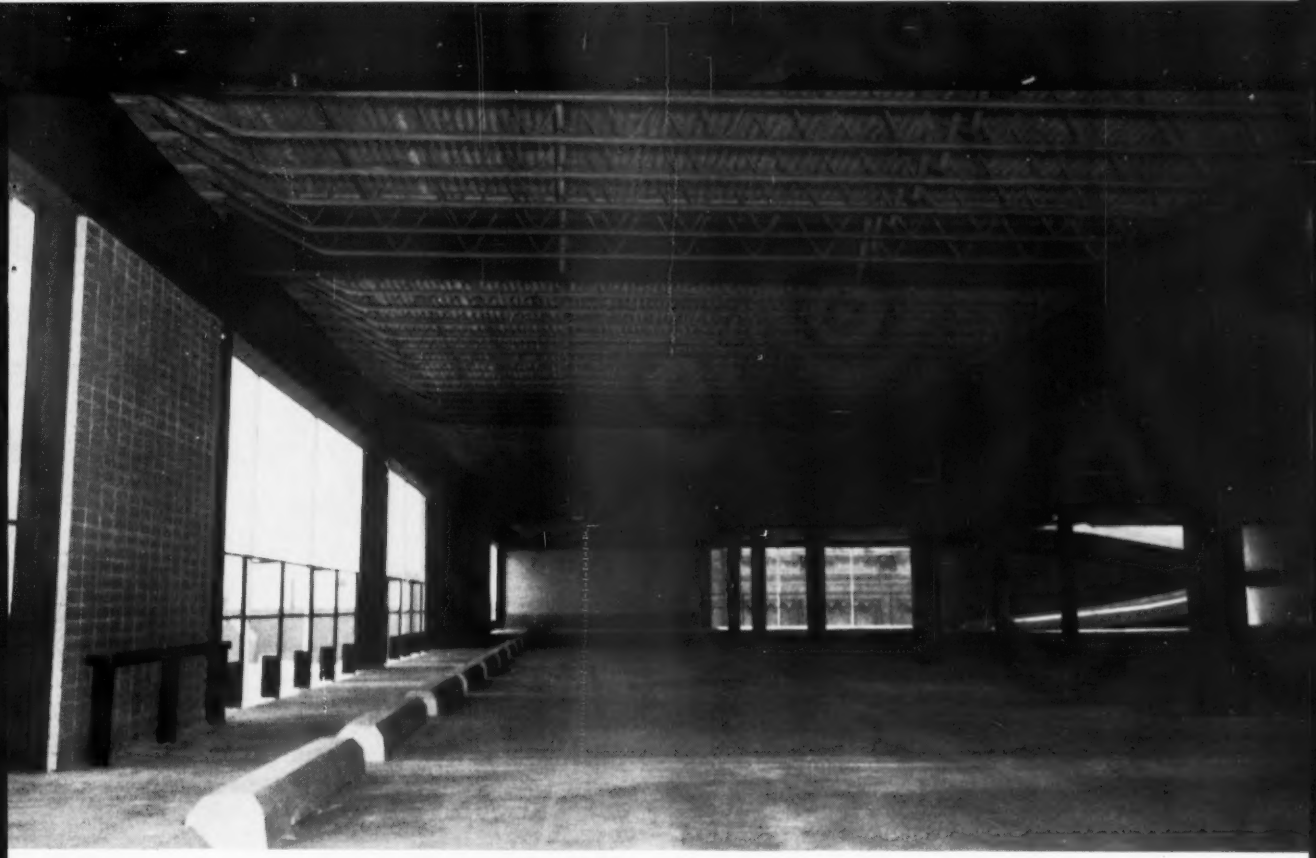
In 1837 the post office department began running the mail in specially constructed coaches that carried no passengers, and this improved service. Even so, newspapers and periodicals complained, feeling they were overcharged for interior service. The newspapers finally became such a load that many mail contractors refused to carry them in the express stagecoaches, relegating them to slower ordinary mails, arousing the wrath of the editors.

Highwaymen

While robbing the mail coach usually brings to mind the Far West, there were stagecoach robberies along the National Road. One express stage was successfully held up in 1837 and the robbers escaped. But unless the bandits had more than a normal interest in current affairs their work was for little; the stage carried only newspapers.

Originally the Road right of way was 80-ft wide. As it fell into disuse, property owners in villages moved in closer and closer on the once-proud thoroughfare. And now there is even less . . . a few old stone bridges, stretches of roadway meandering nowhere, some faded mileposts, a few references in history books are all that remain of what was the longest, straightest road in the world, this country's first major civil engineering project.

It served its purpose well, however. It helped bind the original 13 states to the new lands of the west when there was much to hold them apart. ▲▲



USS AmBridge Steel Joists

safely support 118,125 sq. ft. of parking space!

THIS new 9-level parking garage in downtown Gary, Indiana, is a good example of all-weather construction.

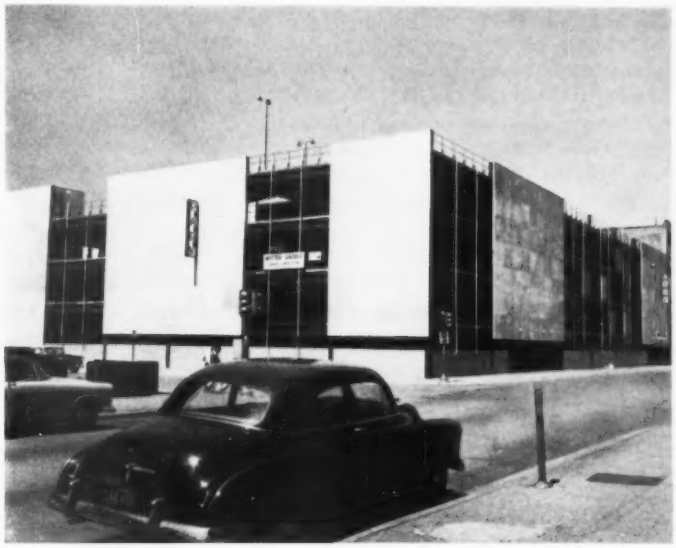
Erection of the 340-car, 125′ x 210′ x 45′ steel-frame building proceeded without interruption right on through the winter. Cold weather did not interfere with the construction of 118,125 sq. ft. of floors, since AmBridge Standard Steel Joists could go up independent of the flooring. Thus, concrete could be poured immediately after each level was completed, or at any convenient time.

This carport was designed by Beine, Hall & Curran, Architects and Engineers, and constructed by Witter-Gaddis Corporation, both of Gary. American Bridge fabricated and erected 189 tons of AmBridge Standard Steel Joists and erected 500 tons of structural steel.

USS AmBridge Steel Joists provide rigid, lightweight and economical construction for any type of floor, roof and ceiling.

FREE 40-PAGE CATALOG contains complete design information for spans up to 120 feet. For free copy, write to American Bridge, 525 William Penn Place, Pittsburgh, Pa. Or get in touch with any of the offices listed below.

USS and AmBridge are registered trademarks



American Bridge Division of USS United States Steel

STEEL JOIST INSTITUTE MEMBER

General Offices: 525 William Penn Place, Pittsburgh, Pennsylvania. Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

How You Can Negotiate With the Navy

CAPT. J. A. McHENRY
Civil Engineer Corps
U. S. Navy

Captain Joseph A. McHenry graduated from Villanova University in 1927 with the degree of Bachelor of Science in Civil Engineering. He was then successively employed by the Pennsylvania Dept. of Highways; United Engineers and Constructors, Inc.; the Electric Power Equipment Corp.; and the Construction Division of the U.S. Quartermaster Corps. McHenry was appointed Lieutenant in the Civil Engineers Corps of the U.S. Naval Reserve in 1940, advancing to Commander in 1944. He then served as temporary Captain from 1945 to 1946, being transferred to the U.S. Navy and promoted to his present rank in 1951. Captain McHenry became Deputy Chief of Civil Engineers of the Navy, and Deputy Chief of the Bureau of Yards and Docks in 1953. In 1953 he was made District Public Works Officer, 12th Naval District, a post he now holds.

THE NAVY'S Bureau of Yards and Docks has over a century of contracting experience with the construction industry. As a result of this experience, most of the lessons regarding construction contract procedure have been learned, and the Navy's practices in this area are highly purified. But because of relatively short experience in engineering contract procedures, a state of evolution exists.

One of the questions that has not been completely and unanimously resolved by those involved is the rate at which the Navy should compensate an engineer as the project proceeds. The Navy Civil Engineer Corps, which operates the Bureau of Yards and Docks, has many different and conflicting ideas on this. It is felt, however, that time and experience will purify the engineering contracting procedures to the same level as that generally attained in construction contracting.

Two Types of Engineering Contracts

The Navy employs two general types of engineering contracts. The most common type is the A&E (architectural and engineering) contract. The other is called the ES, better known as the engineering services contract. The A&E contract involves the making of contract plans and the writing of specifications for construction, the providing of consultation during the construction period, the reviewing and approving of vendors' drawings, and finally the altering of the original design drawings to the "as built" conditions. The ES type contract is for practically every other type of engineering service — property surveys, test borings, feasibility studies, master plans, economic surveys, and others.

Three methods for selecting consulting engineers are used by the Navy, none of which involves bidding. The Civil Engineer Corps would no more consider taking bids for an engineering service than it would consider taking bids for a personal surgical

operation. The Navy philosophy is to get the best professional service available under the statutory limits established for professional fees.

The basic method used throughout the Service involves selection by a Board for Contract Awards. This Board varies in size from one naval district to the other but always has a minimum of three members and may have up to seven. Members of the boards are all engineers, and there are usually both military members and civilian members. Lists of prospective engineers in private practice are compiled from a review of the brochure files held in each district office. This list is reviewed by the technical professional personnel of the district office and finally comes to the Officer in Charge for approval. The approval by the Officer in Charge is an acknowledgment that each firm on the list is eminently qualified for the work. The Board then interviews representatives of each firm on the list in order to make its ultimate determination. The selection by the Board of one of the firms on the list is tantamount to an engineering services contract award.

Certain questions are asked the aspiring consulting engineers by the Board.

¶ What is the total value in cost of construction for any or all Federal projects on which you have worked or are working?

¶ Are you or have you ever been involved in any Federal investigations?

¶ Do you have or have you had any claims against the Federal government?

¶ What is the organization of your firm; an individual ownership, a partnership, or a corporation?

¶ What, if any, expansion of your current facilities would be required and what, if any, additional personnel would be required?

¶ Can you demonstrate any of your experience on work comparable to that under consideration?

Comprehensive Study

The adequacy of supporting firms is looked into, and the diversification of their talents is examined. The geographical location of the firm is important in that the Navy normally uses A&E services from the state and area in which the construction project is to be located. The basic problem confronting the Board in these selections is to find the firm best qualified to do the work, at that time, and in the amount of time allowed for the performance of the work. Frequently a firm with the best demonstrated experience in the area of consideration may be burdened with other commitments, while a less experienced though qualified firm may have most of its talents available. The Board must weigh these factors in making its selection.

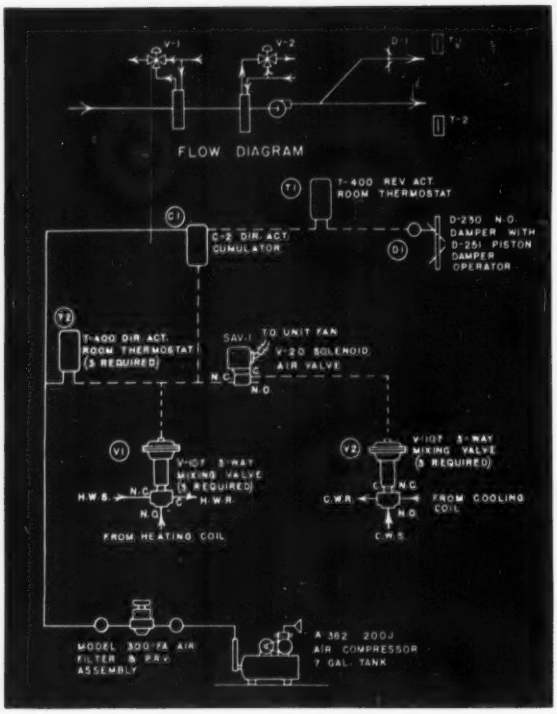
Another method for selection is the use by the Contract Board of the brochure files without resorting to interviews. This method is used when the interview type of selection is not considered necessary or pertinent to the work proposed – either because of the simplicity of the job or the speed required for making the selection. The selection is made from among the engineers' brochures, and the engineer selected is invited to appear before the Board for further interview and confirmation of his capacity to undertake the work.

Direct Selection

There is one additional way to select, which can be but seldom is used, and this is the direct selection of a firm either by the Board or by the Officer in Charge. This is resorted to only in the most extreme circumstances. For example, one of the West Coast district officers once made a direct selection of the engineer for the design of a cyclotron.

In using any one of the three methods of selection, there is no discussion regarding the fee. The selection is made on a purely professional basis.

After the selection has been made by the Board and approved by the Officer in Charge, the second stage, the negotiation of the fee, is reached. This negotiation must be based on a well defined scope


FLOW DIAGRAM
T-400 REV. ACT. ROOM THERMOSTAT
C-2 DIR. ACT. CUMULATOR
D-230 N.O. DAMPER WITH D-251 PISTON DAMPER OPERATOR
T-400 DIR. ACT. ROOM THERMOSTAT (3 REQUIRED)
SAV-1 TO UNIT FAN
V-20 SOLENOID AIR VALVE
V-10F 3-WAY MIXING VALVE (3 REQUIRED)
V-10T 3-WAY MIXING VALVE (3 REQUIRED)
H.W.S.
H.W.R.
FROM HEATING COIL
C.W.R.
C.W.S.
FROM COOLING COIL
MODEL 300-FA AIR FILTER & P.R.V. ASSEMBLY
A 382 200J AIR COMPRESSOR 7 GAL. TANK

Typical pneumatic control system applied to three single zone air conditioning units serving a branch bank building.

WHEN IS A SYSTEM BIG ENOUGH TO USE PNEUMATIC CONTROLS?

Size isn't a problem at all! For the fact is, the smaller air conditioning, heating and ventilating systems require just as good controls as the big systems. Thus, if you base your decision on quality, your specification should call for pneumatic controls, regardless of the size of the system.

You'll find the specialist Johnson organization just as ready to help on your smaller jobs as on the big installations. This includes both planning *and installing* the control system and, beyond that, backing it by Johnson's own full-time, factory-trained service experts.

Johnson offers the most complete line of pneumatic temperature, humidity and pressure control equipment to meet your clients' exact requirements.

A nearby Johnson engineer will be glad to answer your questions about pneumatic controls and explain their application to the smaller systems. Call him soon. Or write to Johnson Service Company, Milwaukee 1, Wisconsin.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

of the work. Unless the scope has been outlined and detailed, neither the consulting engineer, the architect, nor the Contract Board can discuss intelligently an appropriate fee.

Once the scope of the work is defined, and prior to negotiations, the Navy Engineers plan the accomplishment of the engineering effort. The number of drawings to be made, the man-hours involved, the specification writing effort, the printing and duplication effort, and all of the engineer's out-of-pocket direct expenses are computed. These costs then are burdened with overhead, profit, taxes, and miscellaneous items so that an appropriate fee can be determined. In addition to this, the Navy has a set of experience curves which are based on past construction costs and engineering fees paid for varying types of work, such as power plants, hospitals, runways, waterfront structures, and others. The project under consideration is introduced into these curves and the percentage fee is determined. This is compared with the cost estimate for the work, and the two figures are balanced one against the other. The Navy is then in a position to discuss costs and fee with the selected engineer.

Free Exchange of Ideas

During these negotiations the requested fee is frequently in excess of that which has been determined by the Navy Engineers. When this happens there is a free exchange of opinion, and the Navy computations are presented to the engineer, and he is invited to correct, comment upon, or criticize them.

Under this system of free exchange of information very little room exists for deadlock in a negotiation and invariably intelligent compromises on both sides result in agreement. This, then, is the normal procedure for selecting A&Es and negotiating professional fees.

For surveying and many other engineering services, the identical procedure is followed. If the job is such that there are unknown factors that cannot be intelligently determined and priced during the negotiations, a lump sum fee is abandoned in favor of unit prices. The prices will be for man days, or survey party days, or set-ups for test borings at so much a hole or so much a foot. In every instance these prices are determined by negotiation and never by bid.

The Navy is interested in getting the highest type of professional services for its work and freely recognizes that this highest type of professional service is not available at pinch penny rates. In truth, the Navy makes every effort, within the statutory limit of six percent, to compensate the consulting engineer adequately for the services rendered, and always selects the engineer on a purely professional basis. ▲▲

In the New Narbonne High School Heating System...

GILSULATE®-protected underground pipe carries 232° F-water 14,000 feet

Built on a 40-acre campus, the New Narbonne High School in Los Angeles has complete educational and recreational facilities for 2,000 pupils; including 5 academic structures, 3 shops, 2 gyms, library, multi-purpose building, auditorium, and buildings for science, music, art and home-making, driver education, agriculture and administration. Architects and engineers: Daniel, Mann, Johnson & Mendenhall.

The heating system is an important feature of the attractive and functionally-efficient New Narbonne High School in Los Angeles. One central boiler plant with four low pressure boilers, hot water converters and pumps, supplies heat for all 19 buildings.

The distribution system—of all-welded pipe with necessary expansion loops—is laid in a 7,000-foot-long trench skirting the spiral shape of the building formation. Buildings are connected to the mains by reverse return systems running along the outside perimeter of each building, and heat from forced air ventilators can be regulated by individual room controls.

All underground piping is insulated with GILSULATE, Type A. So effective is this easily-installed, economical insulation material that during the curing process, prior to placing the system in operation, hot water, with an input temperature of 232°F was circulated through approximately 14,000 feet of pipe and returned to the boiler plant at 226° F.... *a heat loss of only 6 degrees!*

In addition to its excellent insulating properties, GILSULATE is chemically neutral in all soils, dielectric and waterproof. Why not investigate the value of this low-cost, poured-in-place insulation? For complete information, see your local GILSULATE distributor, or write our Salt Lake City office.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp...pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by buried hot pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE**:
   Type A for 220-500° F. temp. range
   Type B for 300-585° F. temp. range
   Type C for 385-520° F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF UNDERGROUND HOT PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY

Affiliate of Barber Oil Corp. & Standard Oil Co. of California
Offices at: Municipal Airport P. O. Box 15, Salt Lake City, Utah
3537 Lee Road, Cleveland 20, Ohio
Distributors in Principal Countries of the World

Do you receive Pipe Insulation News? Ask to be put on our mailing list.

A Report From London

JULIAN S. TRITTON
President, FIDIC

Julian S. Tritton, president of the International Federation of Consulting Engineers (FIDIC), is a tireless fighter for the profession. A former partner in the London firm of Rendel, Palmer & Tritton (founded 1838), he is now retired from the firm but continues to serve as its consultant. Tritton has been chairman of the British Association of Consulting Engineers, president of the Institution of Locomotive Engineers, and honorary secretary of the Diesel Engine Users' Association. He is a member of ASME

A FEW WEEKS AGO I was privileged to give a lecture before the Royal Society of Arts. My subject was "The Consulting Engineer and His Contribution to the National Economy," and while the lecture was given under the chairmanship of the Minister for the Board of Trade and was intended to stimulate interest in Britain's export trade, my primary objective was to tell the audience something about consulting engineers and the advantages of independent engineering advice.

The American consultant might be interested in my remarks for two reasons. Firstly, the description I gave of the private practitioner in this country will provide an interesting comparison with the profession in the U. S. I believe it will be obvious that while there are some differences, such as the fact that you generally refer to "bids" while we refer to "tenders," and you sign "contracts" with clients, while we sign "agreements" (leaving contracts to the contractors), the ethical, independent consulting engineers in both nations practice their profession in much the same manner.

Secondly, my lecture, while considerably condensed in the following paragraphs, gives an idea of the type of information about consulting engineers we feel is needed by government and private clients in this country as well as by administrations in overseas development areas. This may be needed in the United States as well. Certainly, all of us interested in the development of our profession should take every opportunity to present our case to potential clients, and in my lecture I show how we save them money, time, and trouble.

Here is what I said:

What is a Consultant?

Everyone knows what a doctor, a lawyer, or an architect does, because most people at some time

or other have had occasion personally to use their professional services. But comparatively few people know what a consulting engineer does, or realize how much they owe him for their safety and comfort when they use the bridges, harbors, railways, power and water supplies, and other amenities which are the result of his skill in, to quote from our Civil Engineers' Charter, "directing the great sources of power in nature for the use and convenience of man."

One reason why the consulting engineer is not better known is that there are so few of them. There are only some 500 members of the [British] Association. All are Chartered Engineers; that is, all are members of one or more of the three parent Institutions – civils, mechanicals, and electricals – whose combined membership exceeds 80,000.

Code of Practice

When the Association of Consulting Engineers was founded in 1913, its bylaws, rules, and code of practice embodied and amplified the provisions of the parent Institution bylaws, so as to cover members practicing in all fields of consulting work. The list of members shows that there are 22 branches of engineering in which members practice and many of these are subdivided further into various specialist headings.

The Consulting Engineer

A consulting engineer is defined as a person possessing the necessary qualifications to practice in one or more of the various branches of engineering, who devotes himself to advising the public on engineering matters, or to designing and supervising the construction of engineering works. What distinguishes him from other engineers who may be capable of carrying out these duties is that he must be in a position to give independent advice, that is to say that he has no commercial or manufacturing interests such as would tend to influence the exercise of his independent professional judgment in the matters upon which he advises.

The Clients

The consulting engineer draws his clients from an almost unlimited field – ministries, government departments at home and overseas, county councils, and provincial and local administrations, as well as those firms in industry and commerce who spend vast sums on new factories, docks, power stations, and other capital projects.

Some administrations may take the attitude, "We employ a fully qualified chief engineer, why should we pay outside consultants to do his work?" The answer depends on the policy of the administration. If the work is outside the normal loading of the chief engineer's staff, the board will decide whether to take on extra staff to cope with the temporary overload, or to call in a consulting engineer, who is experienced in that particular class of work and who has a technical engineering staff available.

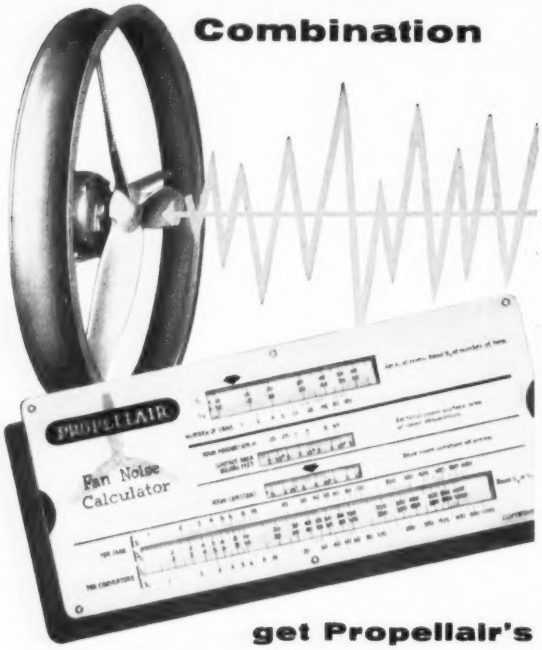
There is no challenge to the chief engineer's authority when a consultant is called in, since he remains in control throughout. Experience shows that he is often glad of an independent opinion to support his recommendations to his board.

One Method

Let us consider this question from the point of view of a potential client, one of the unconverted who have no use for consulting engineers.

We will assume that an overseas administration has decided that a bridge is required to carry city traffic across a river, and their chief engineer has been instructed to obtain tenders for this work. If, as sometimes happens, he is not familiar with the role of the consulting engineer, his first idea is to look through the pages of a technical journal, where he will find the very compelling advertisements of firms of international repute who build bridges. He then probably writes to two or three

New! Simple Slide Rule Accurately Specifies Quietest Fan Combination



get Propellair's new Fan-Noise Calculator

The Fan-Noise Calculator permits prediction of resultant noise that one or more fans will make in rooms of any particular dimensions, construction and accoustical treatment.

Propellair's sone rating system for fans is simple and easily understood. It's based on frequency spectrum noise analysis plotted against the actual effect on the human ear. The sone system is far superior to inaccurate and improperly used decibel ratings . . . permits realistic direct noise comparisons (ten sones are twice as loud as five sones, etc.).

Now you can specify the fan combination your room requires. Write today, on your company letterhead, for your free Fan-Noise slide rule calculator. Send to Propellair Division, Dept. CE, Robbins & Myers, Inc., Springfield, Ohio.

R&M PROPELLAIR®
DIV. OF ROBBINS & MYERS, INC.
SPRINGFIELD, OHIO
Certified Ratings
PFMA

DIRECT CONNECTED | SKY-BLAST® | TUBEAXIAL | VANEAXIAL | CENTRIFUGAL

MOVING AIR IS OUR BUSINESS®

of them and asks them to send in their proposed designs and estimates.

The contracting firms are, of course, only too pleased to oblige, and the news soon gets around the contracting circles that there is a big job in the offing. The chief engineer then is beset on all sides by the agents for the various bridge builders. At the end of a few weeks he has some half dozen preliminary designs and estimates. All designs are different, and estimates vary by 200 or 300 percent.

Let us think for a moment what has been involved in this process. Each of the firms who is putting forward a tender has spent considerable time and money in sending out its engineers to the site, in making inquiries into site conditions, taking soundings, borings, etc., and then getting out a design which it thinks is the most suitable for the job. To get out such a proposal may cost each firm some thousands of pounds, but only one of them, the successful tenderer, will see his money back on this preliminary expenditure. Such a course, therefore, must involve a wasteful expenditure of energy.

The chief engineer then has the difficult task of comparing the offers, which are seldom on a strictly comparable basis. The widely differing features have to be evaluated, and it is always possible that none of the designs embodies all the requirements. When he has thought it all over and made his decision he realizes that his selection, made with the best will in the world, is open to challenge by interested and disappointed parties and that he would be in a much stronger position if his recommendation were supported by an independent professional opinion.

Expenditure of public funds is a grave responsibility, and, be it whispered, even Finance Committees have been known to quail before the threat of a "question in the House" on the awarding of a contract. So at this stage, the board too would feel happier if, in applying for government sanction for funds, they can say the plan has been examined and approved by an independent consultant.

Whom To Call In

In what follows I hope to show how time and effort, which mean money, can be saved in such circumstances by calling in a consulting engineer to advise on the project from the start. His first task will be to ascertain the client's exact requirements. He then will interpret these in his designs, specifications, and conditions of contract, so that tenderers know just what is required and what risks have to be covered. Tenders are then on a fair and comparable basis, and the client thus is assured of the best value for his money.

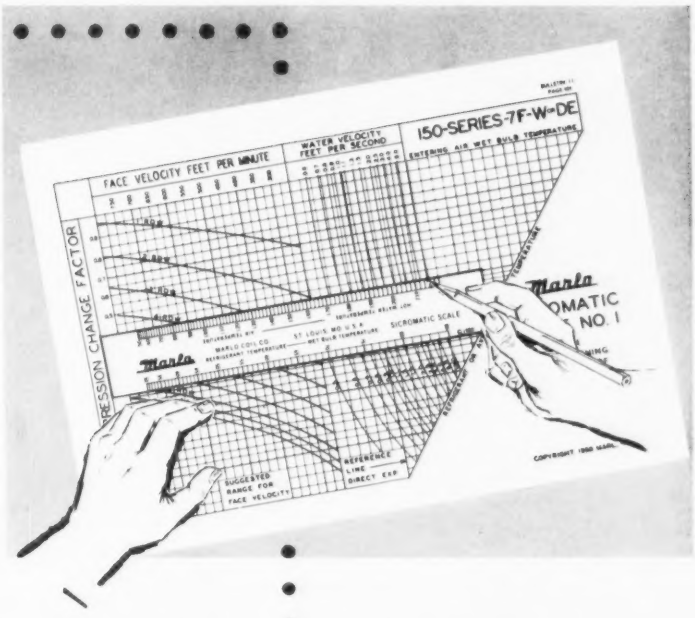
The selection of a suitable consulting engineer is not a difficult matter. Most authorities know the

Now... Save Time... Save Money
ON COIL SELECTION

with *Marlo* sicromatic charts and rule...

for the Architect and Engineer

- No More Trial-and-Error Calculations
- No Interpolations



A QUICK, ACCURATE WAY TO DETERMINE NUMBER OF TUBE ROWS • REFRIGERANT TEMPERATURE • LEAVING AIR TEMPERATURE

When selecting coils, there's no need to waste time on long mathematical equations and trial-and-error calculations with pages and pages of tables. These handy charts and rule from Marlo permit direct graphical coil selection *in a matter of seconds*, with the simple location of two straight lines. On one chart, you can read all necessary data for a particular application, including proper refrigerant or chilled water temperatures.

FREE Revised Bulletin on
MARLO COOLING COILS
Complete with information on design, construction, dimensions, performance characteristics, etc.

Send Coupon Today

Marlo Coil Co.
7100 S. Grand Blvd.
St. Louis 11, Mo.

Please send me your sicromatic charts and rule, and copy of your new revised cooling coil bulletin 11.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

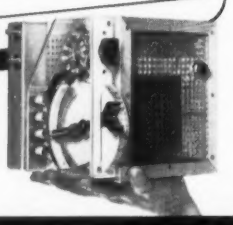
Marlo coil co.
SAINT LOUIS 11, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment since 1925

Immediate Acceptance!

ALREADY ON ORDER FOR:

- ABC-TV DETROIT (3 STUDIOS)
- WHITMAN COLLEGE, WALLA WALLA, WASH.
- UNIVERSITY OF IDAHO, MOSCOW, IDAHO
- ANTIOCH HIGH SCHOOL, ANTIOCH, CAL.
- C.B.C., CANADA



the KLIEGL SCR DIMMER...

4 KW IN THE PALM OF YOUR HAND
5 LBS.—6" CUBE.

The SCR Dimmer performs the functions of any dimmer system available today. It is equally adaptable for use in either directly or remotely controlled dimming installations. Dimmers may be used individually or, when grouped in banks, are fully adaptable to presetting and mastering systems.

Straight forward full wave rectification using 2 Silicon Controlled Rectifiers producing a true sinusoidal sine wave at full output . . . over 98% efficient.

- Silent operation . . . No T.V. interference.
- No parts to wear out. Periodic adjustments unnecessary.
- No Booster transformers needed.
- Infinite loading range.

Send for brochure listing technical data, ratings and operational characteristics.

lighting

KLIEGL BROS.
UNIVERSAL ELECTRIC STAGE LIGHTING CO. INC
321 WEST 50TH STREET • NEW YORK 19, N. Y.
ORIGINATORS AND MANUFACTURERS OF KLIEGLIGHTS

consultants they are accustomed to working with on different types of work and call them in as required. Where a client does not know whom to go to, he has only to ask the secretary of the Association of Consulting Engineers, and the chairman will put forward two or three names for the client to select from. Nomination in this way ensures not only that the engineers or firms named are experienced in the particular class of work, but also that they have the capacity available at the time.

Procedure

The correct procedure is then for the client to approach one of the recommended consultants for a preliminary discussion and quotation. The question of fees will arise and as a general guide to the cost of employing a consulting engineer, the Association has laid down a scale of fees which will be quoted by any of its members when asked to do so. It should be noted that the rules of the Association provide for variation from the normal scale, both above and below it, to allow higher fees to be charged for difficult and special classes of work, while lower fees may be quoted where these are justified for repetitive or other work where the amount of design work is small relative to the total cost of the work.

Negotiation of Agreements

A word of warning here may not be out of place to prospective clients who do not appreciate that consulting engineers may not answer advertisments for professional services, nor may they knowingly compete with one another in the matter of fees.

Some authorities have a rule that all engineering contracts over a certain value must go to public tender. This rule, however, cannot be taken to apply to consulting services, because there can be no specification for them which would put offers on a comparable basis. Indeed it was decided not long ago in an American court that the practice of calling for public tenders for consulting engineers' services was illegal.

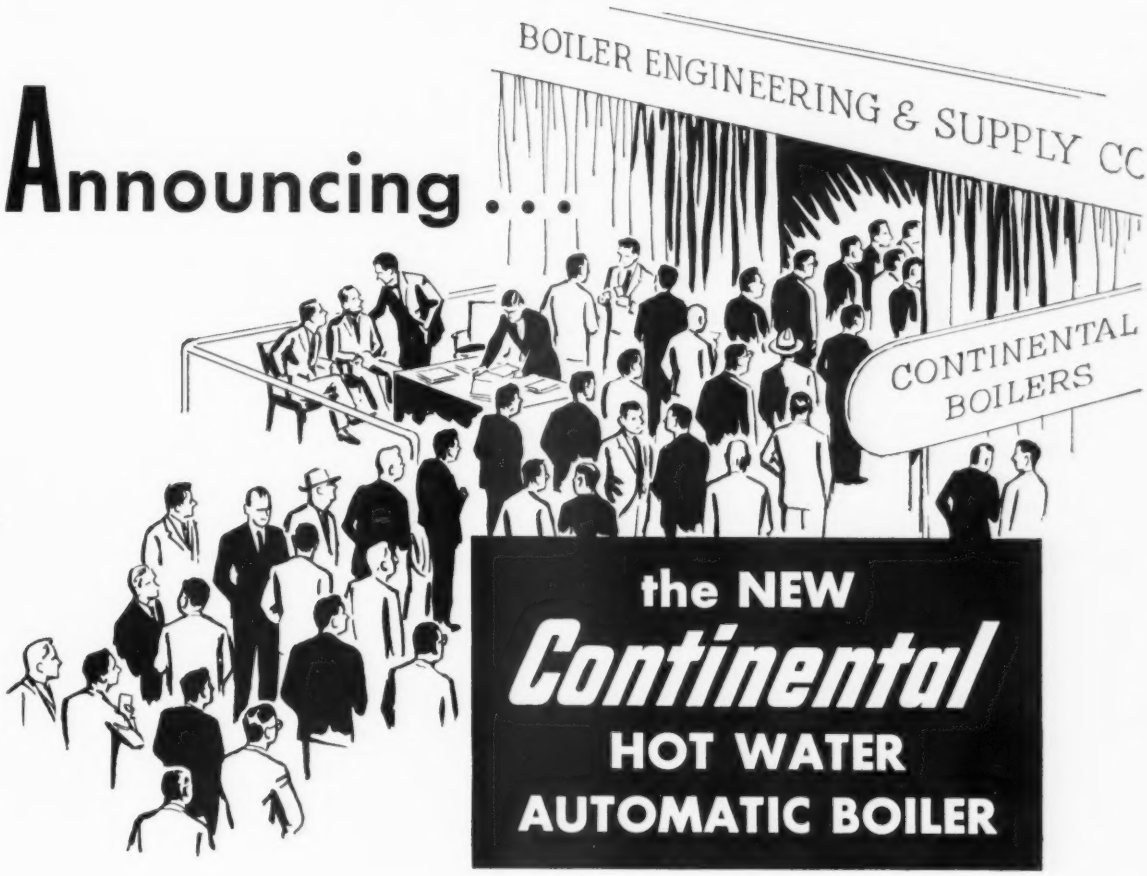
When the terms are agreed the consulting engineer accepts the reference and is given a letter of appointment or signs an agreement.

In this country we have a nice distinction in terms which is sometimes lost sight of. A client signs an agreement with his consulting engineer but a contract with his contractors.

Competition

Although members of the Association do not knowingly compete with one another, they have to meet competition from outside the Association. Such competition comes sometimes from contracting and manufacturing firms who offer consulting and de-

Announcing . . .



the NEW *Continental* HOT WATER AUTOMATIC BOILER

Shown for the first time at the ASHAE Show in Philadelphia

Here is a completely new approach to Hot Water Boiler design. Continental gives you all the features you want for efficiency . . . for economy . . . for low maintenance costs. Check these performance advantages:

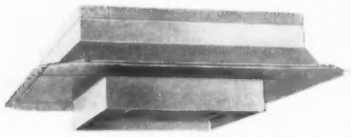
- In the history of package boilers, there has never been a single case of damage due to "thermal shock" with the Continental Boiler.
- Operates at high or low water differential temperatures . . . at high or low rates of water circulation . . . responds rapidly to temperature controls.
- May be used for either direct or reverse flow.
- Has internal expansion space to cushion the dynamic surge of circulators and eliminate entrapped air from system water.

For complete engineering data on the new Continental Hot Water Automatic Boiler, see the Continental representative or write for Bulletin BE-200.

BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

COOK DOES THE REST!

ALL-ALUMINUM VENTILATOR...



FITS OVER PREFABRICATED CURB

...INTO FRAMED OPENING

COOK EASY-TO-INSTALL LOW SILHOUETTE VENTILATORS — Available in sizes to 38,350 cfm. Similar low styling in belt or direct drive, axial or centrifugal flow. Wall models also available.

Shipped completely assembled, with integral conduit to facilitate wiring. Light-weight aluminum construction . . . 38,350 cfm unit weighs only 485 lbs. crated.

COOK "VC" PREFABRICATED STEEL CURB. Complete with automatic or motor-operated louvers if desired. Just place the curb in the framed roof opening and weld, bolt or nail to roof deck. Heavy gage steel — insulated walls — wood top curb for fastening ventilator.

COOK

Write for 20-page engineering catalog, or see 20c/CO, Sweets Architectural File and Engineer's Product File.

LOREN COOK COMPANY
Berea, Ohio

signing services as part of a package bid, or as an inducement to place orders. Occasionally the prospective purchaser is given to understand that he is getting these services free of charge – but a moment's thought will show that there is no such thing as free engineering.

There is also competition from consulting engineers who, for one reason or another, are not members of any professional association. Such people are not tied by any professional code of practice. They can advertise, act under the protection of a limited liability company, and, without guarantee of their competence or independence, can offer services at cut rates.

International Competition

In the international field there is competition between consulting engineers of different countries, particularly when they are looked on as the spearhead of the export drive.

In some Continental countries there have sprung up in recent years national organizations which have been formed by groups of consulting engineers, usually with the backing of finance houses. These organizations are in a position, when a large engineering project is under consideration, to send selected members of the group to the site, make a survey and project report, and then offer consulting service for the scheme. Sometimes these organizations may have the support of their governments.

So far, the United Kingdom has relied on the individual efforts of the leading firms of consulting engineers on such projects. But in view of the increasing international competition, it would seem opportune for some such organization to be formed in this country, and if it can obtain government support, such a movement would be welcomed by the Association of Consulting Engineers.

Relations With the Architect

In the period of postwar reconstruction in this country, architects play a leading role in their responsibility for the design of public buildings such as banks, hospitals, and other major works.

It is sometimes not realized how great a proportion of such works involves specialized engineering knowledge. Nowadays the cost of the engineering work in a large building represents an ever-growing percentage of the total cost. Architects appreciate this and frequently advise the client to call in a consulting engineer to deal with special engineering features involved in the design. On such projects it is, of course, essential to avoid divided responsibility.

This difficulty has been overcome in France where architects and engineers work together under a protocol signed by the two professional societies.

Armco Foundation Piles Support Steel Towers in River Delta Area

Two of the four Armco Piles can be seen inside this dewatered concrete form. Reinforced rod cages will be inserted in the piles before pouring concrete.

Driving Armco Foundation Piles on a batter, from a barge. Four piles support each pier. Four piers were required for each of the 14 towers.

Engineers: Southern Services, Inc., Birmingham, Alabama
Driving Contractors: Bernard & Byrd, Mobile, Alabama

Close-up of one completed pier of the tower base that encloses four Armco Piles. Tower will be attached to large bolts.

Because of increased demand for electricity in northwest Florida, the Gulf Power Company of Pensacola needed an additional transmission line across two miles of the Escambia River's delta. One of the problems was to provide stable footing for 14 new steel towers, each more than 100 feet high. Armco Foundation Piles helped provide this solution.

Because of the marshy area, the pile driver had to be mounted on a barge. And since piles were designed to be driven on a batter, a special pile template was used to guide and simplify driving. Next, a cofferdam was built around the pier. Then, reinforcing rod cages were dropped to the full length of the piling. Finally, concrete was poured, embedding two large bolts for attachment of the tower leg.

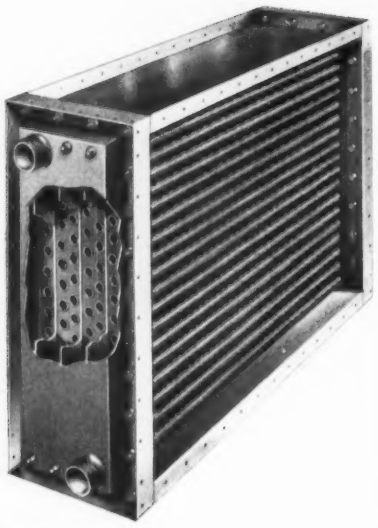
Most of the Armco Piling was 20-inch O.D., driven to an average depth of 46 feet to obtain the 30-ton loading. Piles driven totalled 9,420 feet.

Consider Armco Foundation Piles for *your* next job. Write us for data. Armco Drainage & Metal Products, Inc., 5129 Curtis Street, Middletown, Ohio. In Canada: Guelph, Ontario.

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products



AEROFIN

TYPE R REMOVABLE HEADER

WATER COILS

- Complete Drainability
- Easily Cleaned
- High Heat Transfer

Completely drainable and easily cleaned, Aerofin Type "R" coils are specially designed for installations where frequent mechanical cleaning of the inside of the tubes is required.

The use of ⅝" O.D. tubes permits the coil to drain completely through the water and drain connections and, in installations where sediment is a problem, the coil can be pitched in either direction. The simple removal of a single gasketed plate at each end of the coil exposes every tube, and makes thorough cleaning possible from either end.

The finned tubes are staggered in the direction of air flow, resulting in maximum heat transfer. Casings are standardized for easy installation. *Write for Bulletin No. R-50.*

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N.Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

The agreement divides works into four categories, the architect controlling where the engineering work is subsidiary and vice versa. Either way the client only pays one fee – to the architect or the engineer, whichever is in control.

In this country architects outnumber consulting engineers by ten to one. The proportion is probably the same in other countries such as America where, according to the report of the recent O.E.E.C. Mission to America, consulting engineers are used by architects to a far greater extent than in this country. It is to be hoped that negotiations between the R.I.B.A. and the A.C.E. will bring about a similar result which will be of benefit to the client as well as to the two professions.

Advice to Clients, . . .

In summation we would say to our clients – firstly we can give you our best service if you call us in at the beginning of your schemes. We would much rather keep you out of trouble than get you out of trouble.

Secondly it usually takes a project about a year to go through the procedure I have outlined and, although we can do a rush job as well as any, it is obviously better to allow time for careful consideration of the important works you are considering. According to our normal scale of fees it only costs about 3 percent of the total cost of the work to bring plans and specifications to the tender stage. Surely it is well worth while spending this amount during a recession when money is tight, so as to have the plans and tender documents ready when expansion starts again.

. . . Contractors, and Manufacturers

To our contractor friends we would say we have a common objective in the service we give to clients and customers; it is to see that they get the best possible value for the money they spend on their engineering projects. We are anxious to give you every assistance in the export drive. If you find the openings we will collaborate in the development of the schemes with all the technical advice that is available under our code of practice.

This applies equally to our manufacturing friends, but in addition we would say that we can best help to sell your products when you keep us up to date with your latest designs and technical developments, so that we can incorporate them in the plans we draw up for our clients.

In the exercise of his professional skill and judgment the consulting engineer has an important contribution to make, not only to the national economy but to the amenities and happiness of the community he serves, which in the long run can mean to the peace of the world. ▲▲

When it comes to Clock and Program Systems...

Select the LEADER... STANDARD

TRADEMARK

STANDARD, the world's leading manufacturer of this equipment, offers you the *only* clock and program systems with *all* these features:

- Full 24 hour correction of all secondary clocks–*automatically.*
- "Memory Tape" control–Easy to set, simple to change programming of signals.
- A complete range of *modern* styled clocks.
- Listed by Underwriters' Laboratories, Inc.

And there's this about selecting STANDARD: you *know* you can rely on STANDARD to:

PROVIDE SERVICE–The industry's largest service organization is *on the scene*–nationwide.

KEEP FAITH–Standard's jealously guarded reputation for fair dealing . . . for never letting a customer down . . . is built on a solid foundation–75 years of specialization in electric clock and program systems.

"THE MAN FROM STANDARD" stands ready to assist you. Ask for a visit or request descriptive catalog #245.

75 *years of progress* — *Pioneer in 1884 — Leader in 1959*

THE STANDARD ELECTRIC TIME COMPANY | **89 LOGAN STREET SPRINGFIELD, MASSACHUSETTS**

Travelling Display—Watch for showing in your area. See complete STANDARD Systems in operation.

ALSO MANUFACTURERS OF

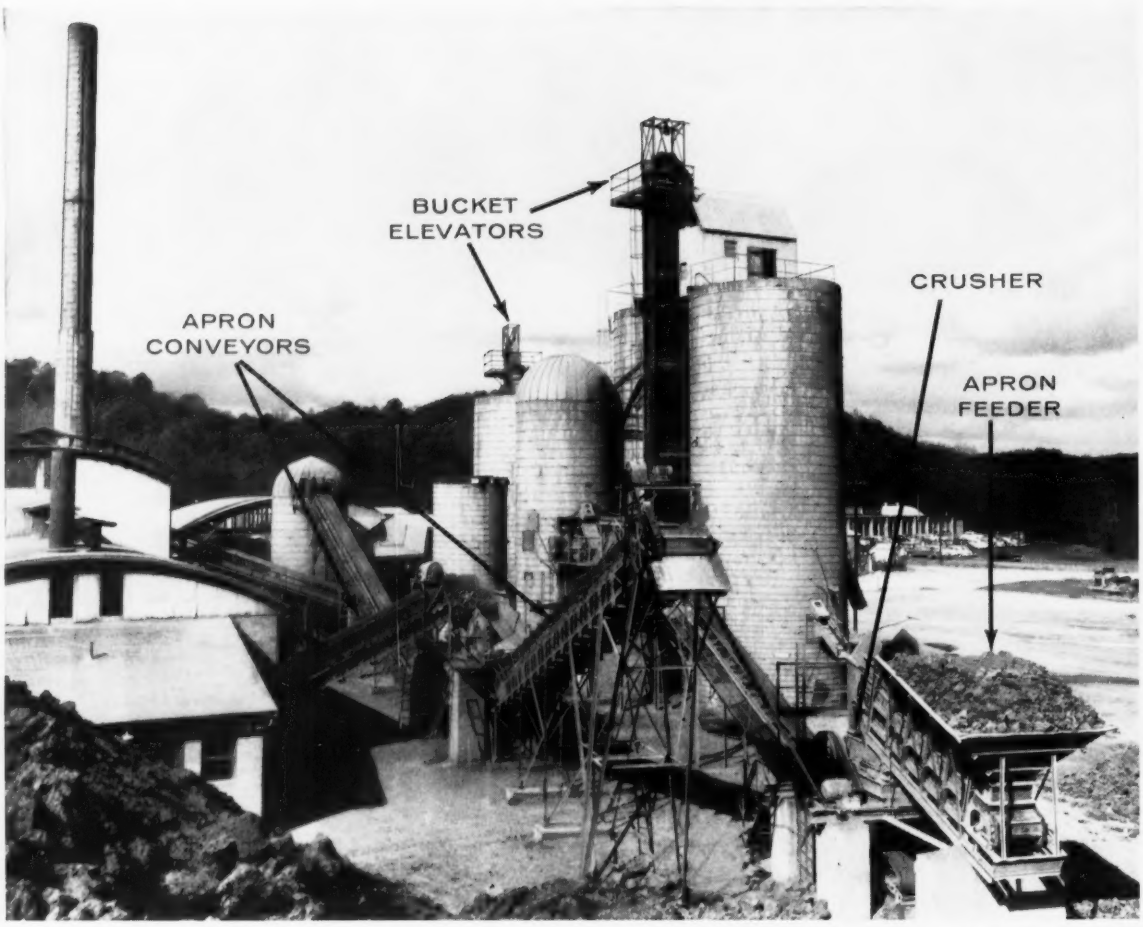
Emergency Lighting Equipment

Voltage Distribution Panels

Hospital Signalling Equipment

Analogue Computors

Fire Alarm Systems



Still other Jeffrey equipment, not visible here, is contributing to the high efficiency of this concrete products plant.

Flexible standard units are engineered by **JEFFREY** to meet your special requirements

Whether you're modernizing an existing system or planning an entirely new plant layout, let Jeffrey engineers assist you. They'll recommend the combination of conveying and processing equipment giving you highest production at lowest possible cost. Jeffrey's long line of standard units permits almost endless combinations to meet special requirements.

For this help, and for catalogs containing complete information on Jeffrey equipment, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio. Replacement parts available from Jeffrey authorized distributor stocks.

In addition to the units named, the following Jeffrey equipment is widely used in the aggregate, stone, sand and gravel, clay, phosphate and sulphur rock industries:

Scraper Conveyors • Spiral Conveyors • Pulverizers • Power Scoops • Car Pullers • Vibrating Conveyors • Magnetic Separators • Stackers • Batchers • Chains • Feeders • Grizzlies • WAYTROLS • Jigs.

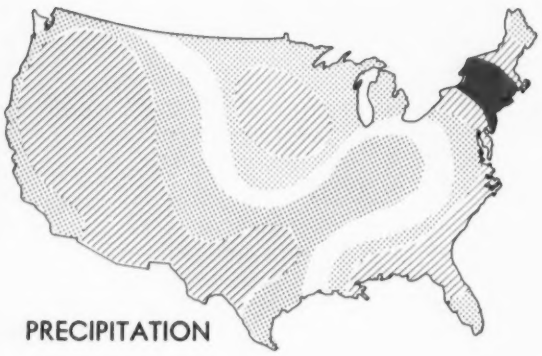
CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

JEFFREY

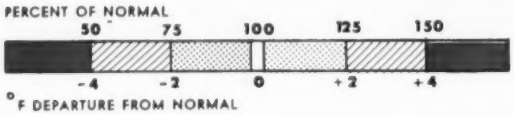
KRICK WEATHER OUTLOOK

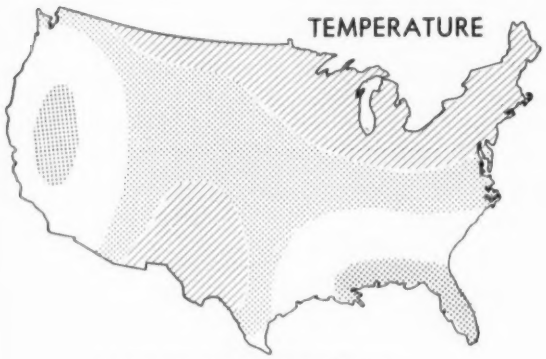
MARCH 1959

Prepared Exclusively for CONSULTING ENGINEER

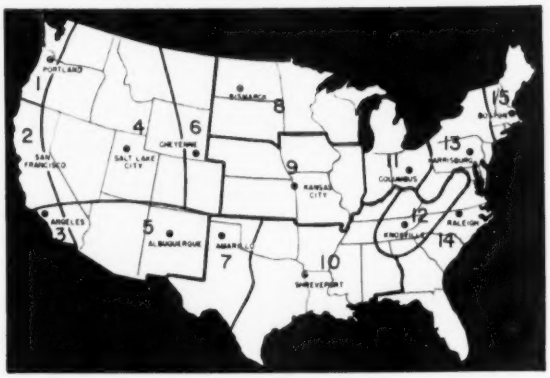


PRECIPITATION





TEMPERATURE



CONSTRUCTION DAY FORECAST LOCATIONS

CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation during the period between the hours of 7 a.m. and 5 p.m. There also cannot have been more than one inch of rainfall on the preceding day.

MARCH HIGHLIGHTS

During March, relatively mild temperatures are in prospect over much of the United States. A slightly cooler than normal month is expected only in the Florida Peninsula-Gulf Coastal area and the Sierra-Nevada and Warner Mountain ranges, where average temperature readings will be slightly below the historical average. From the Continental Divide eastward, above normal temperature readings are anticipated. Warmest temperatures, compared to normal, are likely to occur in the northern and northeastern half of the nation, and in the western Texas-eastern New Mexico area. It will be well to look for frequent storminess to bring much above normal moisture along the eastern seaboard. The northern Great Plains also can expect to have above normal moisture with the heaviest amounts likely in the Iowa-South Dakota area. Near to slightly above normal moisture is expected in the Great Lakes region. In California, frequent localized thunderstorms are likely to bring near normal moisture to some sectors of the state, while others will have drier than normal weather. Unusually dry conditions are expected throughout the Rocky Mountain, Rio Grande, and southwestern regions of the country. The slightly below normal moisture trend will extend eastward into the Tennessee River Valley. Viewing the country as a whole, the south-central and western sections appear to have the best prospects for favorable construction weather. In contrast, eastern and southern regions will experience fewer construction days because of the frequent and heavy storminess anticipated in those areas.

TEAR OUT ALONG PERFORATION.

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed by this group at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing to the home office of the firm at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

MARCH 1959 ESTIMATES															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	30	31	30	31	31	31	22	27	31	29	30	27	31	28
LOWEST	20	26	26	14	27	14	25	1	16	23	14	22	17	24	12
AVERAGE	25	28	29	25	30	22	29	9	22	28	21	27	22	28	19
ESTIMATE	24	28	30	27	29	29	31	12	20	26	22	28	20	25	14

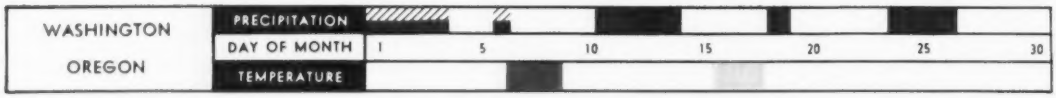
These estimated construction days for key cities in the United States should be interpreted as an average of estimated conditions over the forecast area. To obtain the best results, the forecast number of construction days should be compared with the temperature and precipitation anomaly maps and the timing estimates to determine the probable number of construction days in your locality. The forecast construction days are based on average construction day requirements as defined under "Construction Day Criteria," and should be adjusted for individual operations.

APRIL AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	30	30	30	29	30	29	29	30	28	30	29	29	27
LOWEST	25	25	27	25	29	19	24	12	14	26	22	26	20	26	21
AVERAGE	27	29	29	28	30	24	28	24	21	27	25	28	25	27	25

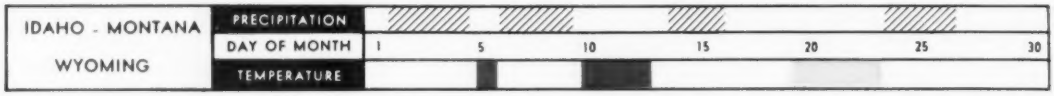
MAY AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	30	30	31	31	30	31	30
LOWEST	22	29	28	28	30	19	28	25	25	25	25	26	23	28	23
AVERAGE	28	30	31	29	31	27	29	29	28	27	28	28	26	30	26

*Historical Average, Not a Forecast

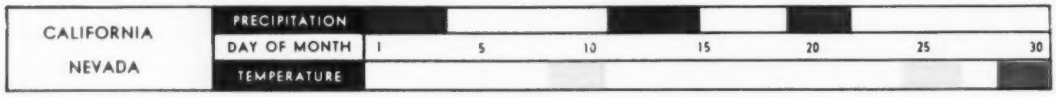
MARCH 1959 TIMING OF SI



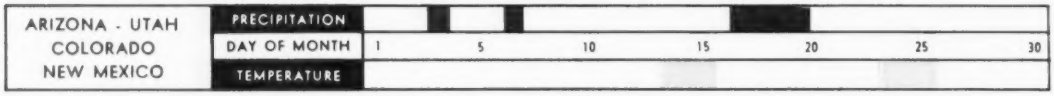
Despite the frequent storminess indicated on the precipitation timing bar, below normal moisture is expected in the Northwest during March. It will be well to look for cool temperatures in the 20's during the indicated cool interval around the 7th or 8th of the month.



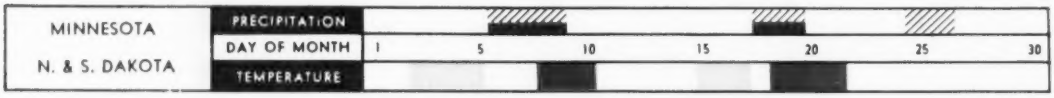
Storminess indicated around the 8th is expected to be heaviest in southern Idaho and southern Wyoming; storminess around the 15th is likely to be heaviest in Montana and northern Idaho. The cool interval following the 10th should be most important in eastern portions of Montana.



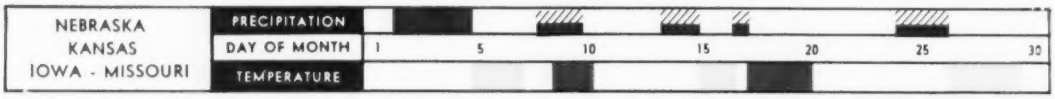
Mostly scattered showers are expected during the opening month storminess. Also look for important moisture around the 20th. Cool temperatures during the last few days of the month are likely to drop minimum readings in California into the mid and upper 30's.



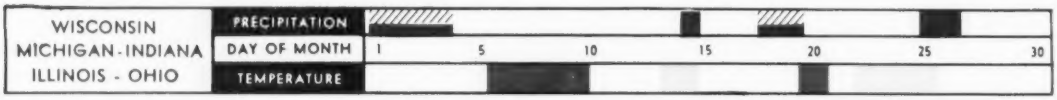
A very favorable construction month is in prospect for this section of the country. The only important storminess should occur during the period shortly after mid-month. Otherwise, no important or prolonged construction interruptions are expected.



Frequent storminess, especially during the last half of the month, should cause some delays in construction activities. Look for the most important cold weather to occur around the 10th. Several days of mild, storm-free weather can be expected around mid-month.



Above normal moisture is expected throughout most of the area during the month of March, with Iowa likely to receive the heaviest amounts. Nighttime temperatures in the teens and lower 20's are expected during the indicated cool intervals.

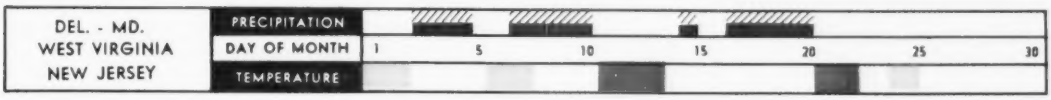


Temperatures throughout this area are expected to range above normal. The cool period indicated preceding the 10th is likely to effect the northern half of the area. A slightly damper than normal month is on tap with southern sections receiving the heaviest amounts.

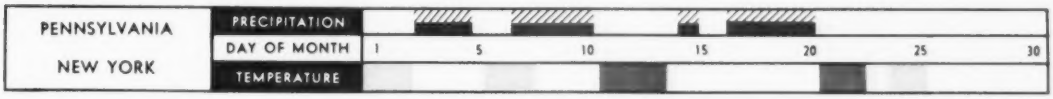
SIGNIFICANT WEATHER EVENTS

RAIN
SNOW
WARM
COLD

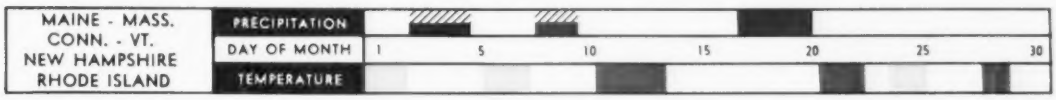
The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.



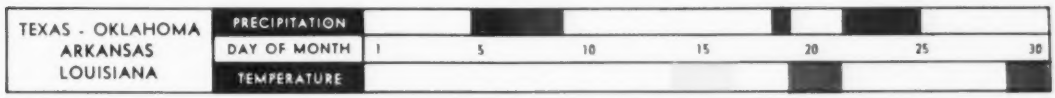
Variable precipitation is expected in this area during March, ranging from wetter than normal in the eastern portion to drier in the western sectors. The indicated storminess shown on the timing bar for around the 19th is likely to be heaviest in the eastern mountain areas.



Look for above normal moisture throughout this area during March with the coastal areas receiving the heaviest amounts. The cool interval indicated for the period following the 10th is expected to drop temperatures to near freezing in eastern areas and into the 20's westward.

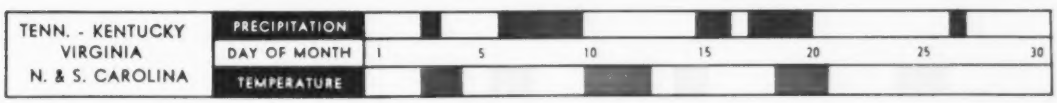


Warm and wet, in relation to normal, summarizes the weather outlook for this area during March. However, the month's warm temperatures should be tempered slightly by the near freezing readings expected during the cool periods indicated on the timing bar.



A warm, dry month is likely throughout this area. Look for stormy, unsettled weather in Oklahoma and in the Panhandle areas during the first few days of the month. During the indicated stormy intervals Arkansas and Louisiana should receive the heaviest amounts of moisture.

Above normal moisture is likely during the month, with the Gulf coast regions and areas along the eastern shore having the heaviest amounts. Near normal moisture is expected in the southern portions of Florida. The cool intervals are expected to effect mostly northern sectors.



The storminess indicated around the 8th is likely to be most important along the south Atlantic coast. Near freezing temperatures are expected during the cool intervals around the 11th and the 19th. Much above normal moisture is expected along the coastal areas during March.

... and that's what they get when you select Westinghouse Life-Line "A" motors for your air conditioning systems

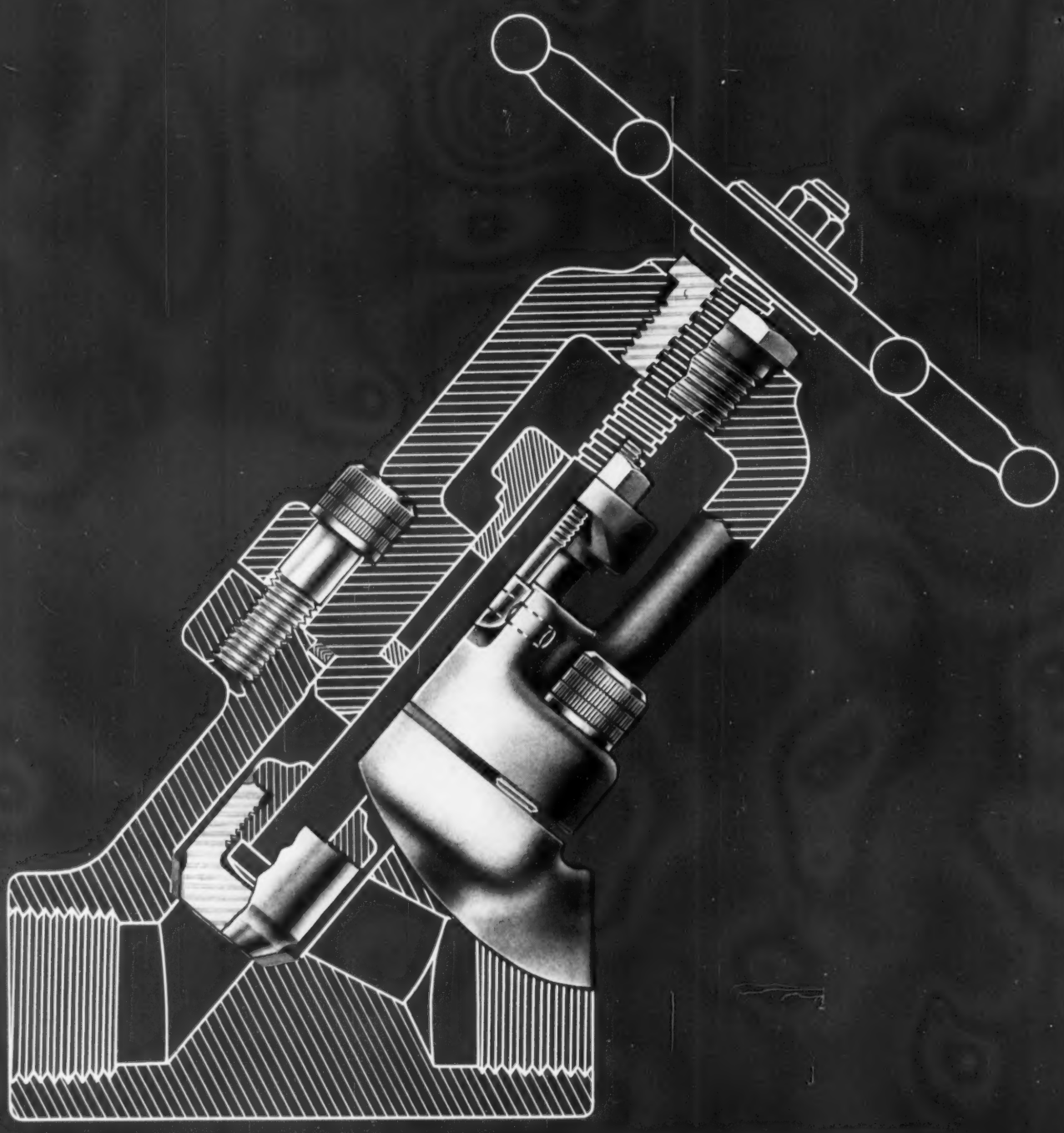
Everybody appreciates a quiet-running air conditioning system . . . many people, by the very nature of their work, not only desire it, they demand it. And, one of the surest ways you can give your customers the quietness they require is by selecting Westinghouse Life-Line® "A" motors for your industrial and commercial air conditioning systems.

Completely sound-engineered, each Westinghouse Life-Line "A" receives a total of 34 separate checks and tests to make sure that you get the quietest motor available today . . . a motor which will contribute substantially to the satisfaction your customers receive from your air conditioning systems.

In addition, your customers will benefit from greatly simplified motor maintenance. Pre-lubrication coupled with fortified insulation and close-tolerance machining makes the Life-Line "A" the nearest thing to a maintenance-free motor available.

For more information on the Life-Line "A" for air conditioning drives, contact your Westinghouse representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa. J-22127

YOU CAN BE SURE...IF IT'S Westinghouse



EDWARD "848" SERIES GLOBE VALVE
(ANGLE TYPE ALSO AVAILABLE)

What's New from Edward Valves

New Products . . . Problems and Solutions. . . Information on Steel Valves from Edward, Long-Time Leader in the Field!

Major Improvements at No Extra Cost Mark New "848" Series Forged Steel Stop Valves

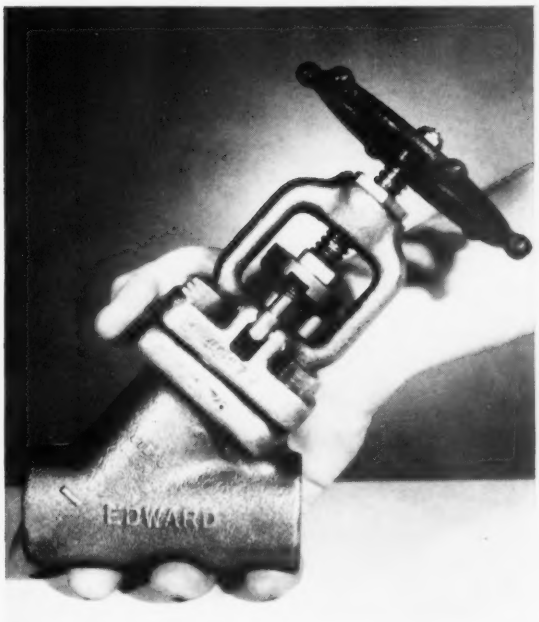
In an industry where any change in design is "news," Edward is proud to introduce a new line of 600-lb forged steel stop valves with so many major design improvements *at no increase in cost.* These Rockwell-built Edward valves are suitable for air, water, oil and other hydrocarbons, anhydrous ammonia and other gases, steam and other non-corrosive fluids.

NEW MATERIALS USED THROUGHOUT

Besides tough drop-forged steel, which is the basis of these valves, Edward introduces such innovations as stainless steel gland bolts, an aluminum-bronze yoke bushing, solid disk of chromium-cobalt-tungsten stainless steel, spiral wound gasket of stainless steel and asbestos, and special alloy cap screws linking body and bonnet.

NEW IMPROVED BODY-BONNET JOINT

Four molybdenum alloy cap screws secure bonnet to valve body. These compact, high-strength cap screws require less space than ordinary nuts and bolts, can be handled with one hand, and deliver maximum compressive force with minimum tightening torque. A new spiral wound gasket, consisting of some 20 turns of stainless steel and asbestos, provides controlled compression not possible with ordinary flat gaskets. Because this spiral wound gasket is free to expand and contract as needed, it "takes up the slack," maintains a leak-proof seal between body and bonnet.



NEW SOLID DISK OF SPECIAL ALLOY

Disk is made of chromium-cobalt-tungsten stainless steel. This new alloy has added resistance to erosion, holds its hardness better under high temperatures than other disk materials. Disk is lock-welded to disk-nut, eliminating wobble and chatter—especially important when valve is called upon for throttling duty.

INTEGRAL STELLITE SEAT FOR LONG LIFE

Valve seat is Stellite—a harder, longer-wearing material with excellent resistance to corrosion, erosion and temperature. Seat is integrally welded to body.

"848" SERIES ROCKWELL-BUILT EDWARD VALVES are available in ¼", ⅜", ½", ¾" and 1" sizes. They are rated at 600 psi—at 910F in carbon steel and at 1030F in chrome-molybdenum steel. Globe or angle types, with screwed or welding ends. Write for facts on performance . . . price . . . and delivery. Address *Edward Valves, Inc., 1210 West 145th Street, East Chicago, Indiana.* (Subsidiary of Rockwell Manufacturing Company.) Represented in Canada by Lytle Engineering Specialties, Ltd., 360 Notre Dame St. W., Montreal 1, Quebec.

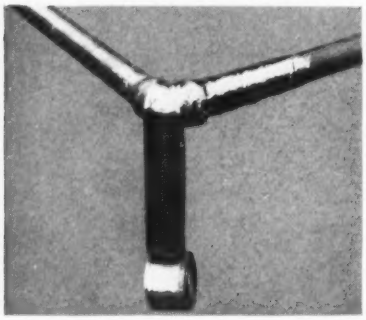
EDWARD STEEL VALVES

another fine product by

ROCKWELL

Catalog 14 contains full data on the complete Edward line of forged and cast steel valves from ¼" to 18"; in globe and angle stop, gate, non-return, check, blow-off, stop-check, relief, hydraulic, instrument, gage and special designs; for pressure up to 10,000 lbs; with pressure-seal, bolted, union or welded bonnets, with screwed, welding or flanged ends.

For True Economy...
MEASURE PIPE PROTECTION WITH A CALENDAR!



Why Engineers Specify TAPECOAT®
...The Quality Coal Tar Protection in Handy Tape Form for

Pipe	Tanks
Pipe Joints	Insulated Lines
Couplings	Splices
Fittings	Sprinkler Systems
Conduit	Bridge Crossings
Cables	Tie Rods

. . . in underground or under-water service

Since 1941, TAPECOAT coal tar coating in tape form has proved itself the best possible protection at lowest possible cost. Pipe and other surfaces TAPECOATED 17 years ago show no signs of deterioration—a record unmatched by any other type of tape.

Field application costs are lower with TAPECOAT because it is so easy to apply with the use of a torch. No tar kettles, technical know-how or special crews are required. TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

Write for illustrated brochure.

The **TAPECOAT** *Company*

Originators of Coal Tar Coating in Tape Form

1569 Lyons Street
Evanston, Illinois

Representatives in Principal Cities

The Word From Washington

EDGAR A. POE
Consulting Engineer Correspondent

WITH THE MISSILE INDUSTRY perhaps the fastest growing industry in the country today, the Pentagon acknowledges that more engineers are going to be needed both in government and industry in the immediate future. Only 10 years ago, missile spending by all agencies of the Defense Department was $98 million. Expenditures for all phases of the program—research, development, and production—will total about $7 billion for the current fiscal year. Predictions are that current missile spending is only a drop in the bucket when compared with future expenditures. Authorities in the capital insist that missile production will double within five years. Meantime, companies engaged in the missile industries are continuing their recruiting of engineers. This means that consultants again may find it hard to get the men they need for their own staffs at salaries they can pay.

Low-Income Housing

In little more than a year from now, more than 475,000 Federally aided public housing units will be occupied by about 2 million people, Federal housing officials estimate, and the additional 110,000 units authorized will be under contract but will not yet be constructed. These 585,000 units should meet most of the demand for such housing by low-income families displaced by highway construction, urban renewal, and other government projects.

Civil Public Works

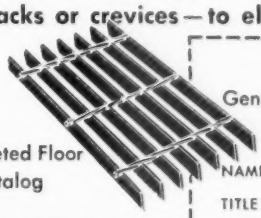
Federal expenditures for civil public works in fiscal 1960 will be the greatest in history. Total Federal public works are expected to total 7.2 billion for fiscal year 1960 starting July 1.

Foreign Investment Incentives

The International Cooperation Administration, which administers the nonmilitary provisions of the Mutual Security Act, is appealing to American businessmen to invest part of their surplus capital abroad. A spokesman for ICA said: "We would like to see private enterprise in this country take over these investments." Of the nearly $4 billion which ICA seeks for fiscal

Q. **Where can I find an inexpensive, light, fireproof, completely ventilated flooring?**

A. **BORDEN ALL/WELD floor grating in this installation furnishes all the above features — PLUS — it is self-cleaning and Borden All/Weld floor grating is solidly welded without cracks or crevices — to eliminate corrosion.**



Write for complete information on BORDEN All/Weld, Pressure Locked, and Riveted Floor Gratings in this FREE 8-page catalog

BORDEN METAL PRODUCTS CO.

817 GREEN LANE ELizabeth 2-6410 ELIZABETH, N. J.

Plants at Union, N. J. — Leeds, Ala. — Conroe, Tex. — Beeton, Ontario

BORDEN METAL PRODUCTS CO.

Gentlemen:

Please send me BORDEN Catalog

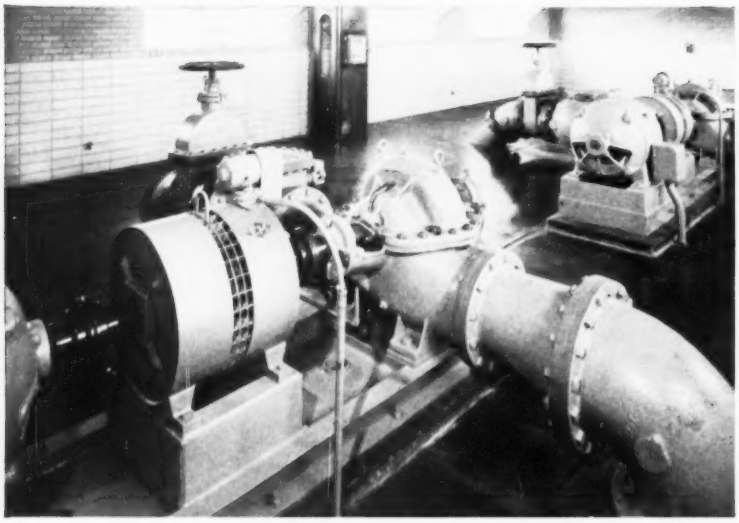
NAME .....

TITLE .....

COMPANY NAME .....

ST. AND NO. .....

CITY AND STATE .....



E-M Ampli-Speed Drives provide Odessa, Texas Municipal Sewage Plant with adjustable pumping rate of 1 to 5.4 MGD. Pumps are held to ±2% of manually selected speeds.

Make two pumps do the work of three!

Here's how Odessa, Texas did just that with adjustable speed E-M Ampli-Speed Drives

PROBLEM: Odessa, Texas wanted to increase sewage facilities to treat sewage effluent as a source of industrial water for chemical and rubber plants.

OBJECTIVE: They needed a new, efficient sewage pumping station at minimum cost, with provision for future capacity.

SOLUTION: Odessa officials called in Parkhill, Smith & Cooper, consulting engineers of Lubbock, Texas. P. S. & C. suggested two alternatives: 1. Build a plant with three pumps, including one for peaking and standby; or 2. Install two pumps with E-M Ampli-Speed Drives.

Parkhill, Smith & Cooper favored the 2-pump plan for these reasons:

Minimum Capital Investment. The three-pump plan would tie up a considerable amount of capital in an extra pump, motor and control without adding appreciably to the volume of sewage pumped.

100% Peak Standby Capacity. Two pumps with E-M Ampli-Speeds could handle present demand efficiently, yet still have enough reserve capacity for 100% peak standby.

Low Cost Expansion. Later another pump could be added to *double* the station capacity and still allow 100% peak standby. And as a further saving, the building would *not* have to be enlarged to accommodate this third pump.

RESULT: Acting on the advice of its consulting engineers, Odessa accepted the 2-pump plan and now enjoys efficient, low cost pumping.

As your clients' pumping needs grow, give them the economy and versatility of E-M Ampli-Speed Magnetic Drives. Call your nearby E-M Sales Engineer and write for Bulletin No. 243. It contains selection charts and tells how Ampli-Speed works.

E-M

4400-TPA-2201A

ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

Specialists in making drives do **EXACTLY WHAT YOU WANT THEM TO**

1960, $1.6 billion would be for military assistance for friendly countries. About $211 million is earmarked for engineering and other technical services to show the people in those countries how to carry out properly their important development programs.

Actually, ICA would like to see the Boggs bill passed as an incentive for U.S. private investors. The Chairman of the House Ways and Means Subcommittee on Foreign Trade, Representative Hale Boggs of Louisiana, expresses confidence that his bill, called the "Foreign Investment Incentive Act of 1959," has a favorable chance of passage. That measure, bearing six principal sections, seeks to promote American industry abroad, and thus reduce expenditures for foreign aid. It would create a new class of foreign business corporations, which would be domestic corporations that could function substantially as foreign based corporations now do. It also provides for a reduction in U.S. taxation on profits made abroad.

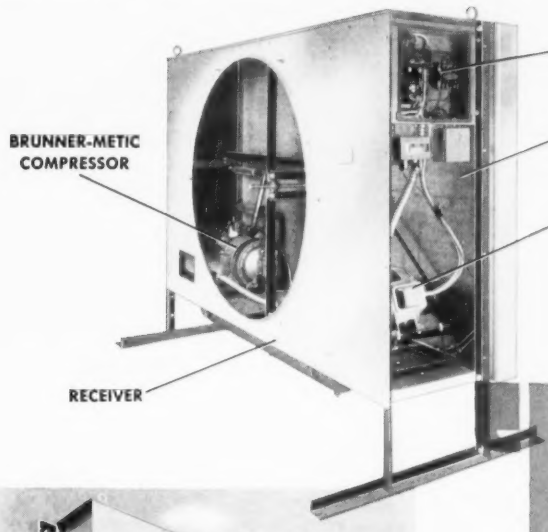
Radioactive Waste Disposal

Nuclear power, instead of becoming economically more competitive with conventional power, could become increasingly costly unless the industry finds cheap means to dispose of radioactive wastes. The Joint Congressional Committee on Atomic Energy conducted hearings on the unsolved problem. It was brought out in the hearings that highly radioactive waste products currently are stored in underground steel and concrete tanks, while low level, short-lived radioactive wastes are discharged and diluted in the air, water, and soil.

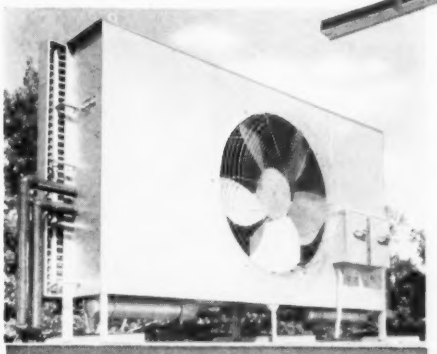
Rural Electrification

Despite intermittent criticism by the National Rural Electric Cooperative Association that the Eisenhower Administration has a top-secret plan to liquidate the REA Cooperatives, there is nothing to the persistent reports. More

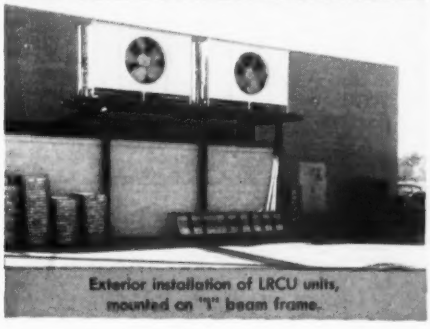
NEW CONCEPT IN BUILT-UP AIR CONDITIONING SYSTEMS



DUNHAM-BUSH 'LRCU' UNITS

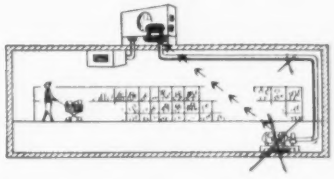


Typical rooftop installation of LRCU unit.



Exterior installation of LRCU units, mounted on "I" beam frame.

By incorporating the compressor and receiver in the same casing as the remote air cooled condenser there are substantial savings in space and installation costs on built-up air conditioning systems.



Eliminate expensive installation costs . . . plumbing . . . wiring . . . with a Dunham-Bush 'LRCU' Large Remote Condensing Unit. Here's a complete package consisting of a remote air cooled condenser, semi-hermetic compressor, magnetic starter, receiver, controls and refrigeration accessories all piped and wired.

Install on the roof (or other convenient location) and run the necessary refrigerant lines to the lowside equipment. Make electrical connections and the system is ready for operation.

Available in 5 models from 10 to 30 tons. Two-step starting makes units readily adaptable for capacity control. Two compressors furnished on 20, 25, and 30 HP units.

Write today for complete information.

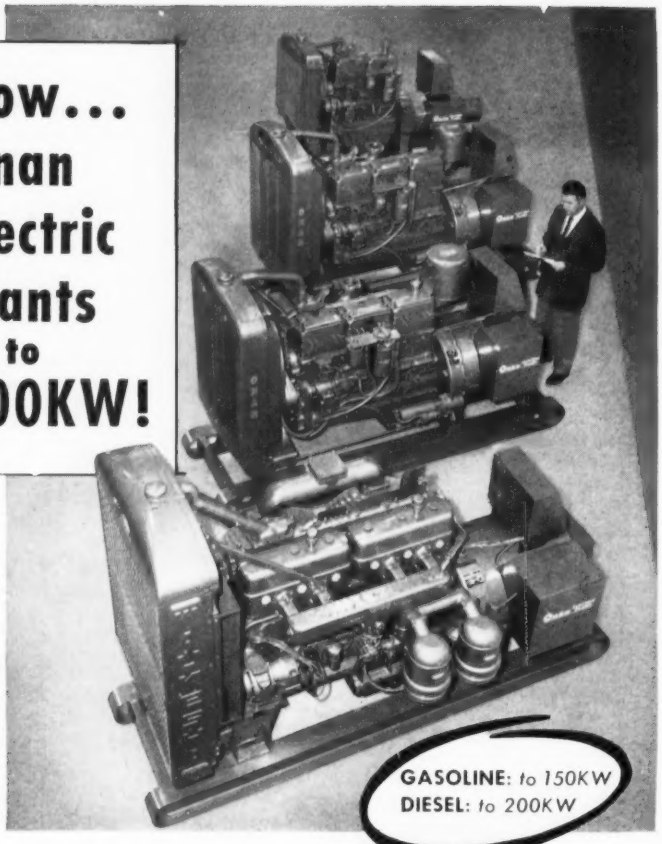
Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

Now... Onan Electric Plants to 200KW!



New Magneciter Generator gives important performance advantages*

Now you can have Onan engineering and Onan dependability in high-capacity plants, too! In gasoline-powered models, 100, 125, and 150KW sizes have been added to the line. New diesel models include 10, 15, 25, 35, 50, 60, 75, 100, 125, 150, 175, and 200KW capacities. All standard voltages are available.

All models are powered by heavy-duty industrial engines matched to the power requirements of the generator. Custom modifications to meet the needs of particular applications add to the versatility of the new Onan line. Automatic controls for standby installations are available for each model.

All plants 100KW and larger are Magneciter-equipped

This new Onan generator with static exciter and voltage regulator has these advantages for both standby and primary power installations:

- **Simplicity** — Eliminates hundreds of electrical connections, the commutator and its brush rig.
- **Constant voltage** — Voltage dip is less than 20% with motor starting load. Stable generator operating conditions re-establish within two seconds after load is applied.
- **Lighter weight, more compact** — Plants are shorter by a foot or more, lighter in weight.
- **Less maintenance, easier servicing** — The static exciter and regulator are externally mounted and easily accessible.

*Onan alternator with static excitation and static voltage regulation.

Specification kit available now! Write for it!

Onan builds electric plants from 500 watts to 150KW, gasoline-powered; 3,000 watts to 200KW, Diesel-powered.

D. W. ONAN & SONS INC.

2653 University Ave. S.E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • KAB KOOLER • GENERATORS

Onan ELECTRIC PLANTS

than 95 percent of the nation's farms now are electrified. In answer to Clyde Ellis, general manager of the big trade association for the REA Co-ops, the Secretary of the Interior, speaking for the Administration, said, "If we're killing the REA Cooperatives, we're killing them with kilowatts, drowning them with dollars, and hanging them with miles of transmission lines . . . Under the Eisenhower Administration, the REA has gained 800,000 consumers, and the average consumer has increased his use of electric power nearly 50 percent."

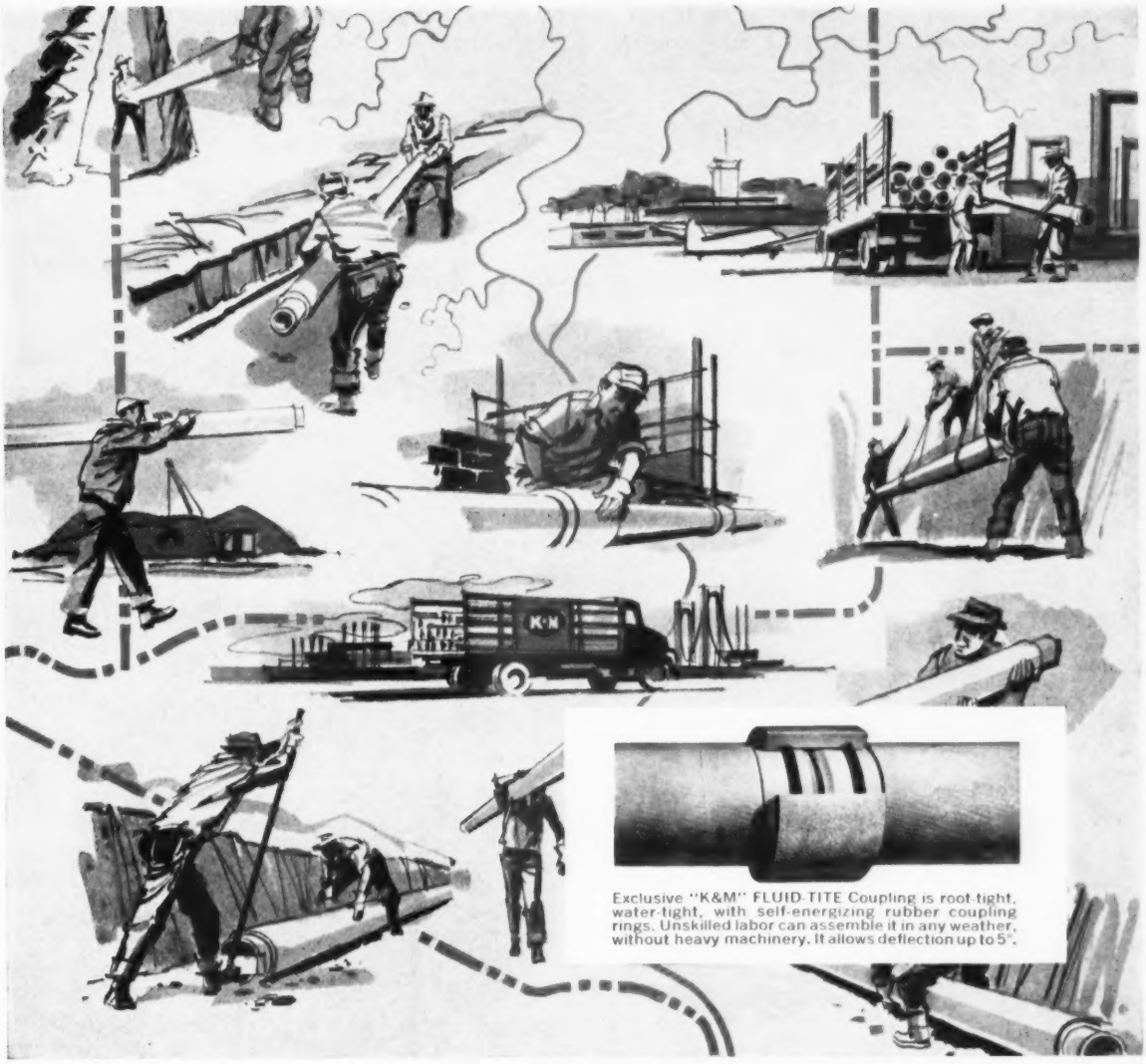
Records show that REA now has 986 active electric borrowers. A total of $215,200,000 in electric loans to 260 borrowers in 1958 brought the cumulative total of loans made in the 23-year electrification program to $3.8 billion.

AEC Budget

Although some of private industry's enthusiasm for peaceful atomic energy declined during the past year because of expensive costs of experimental development, expenditures for the Atomic Energy Commission are scheduled to reach an all-time high of $2.7 billion in fiscal 1960. The budget provides for continuation of construction, development, modification, and operation of government-owned experimental and prototype power reactors including the plant at Shippingport, Pa. The new year began with the Federal investment in atomic energy facilities amounting to over $7 billion.

Water Studies

Both Army and civilian engineers, who specialize in navigation, flood control, hydroelectric power development, and allied water uses, apparently are going to have an increased schedule during the 1960 fiscal year. Pending before Congress is President Eisenhower's budget recommendation calling for about $865 million for rivers, harbors, and flood control, an increase



Exclusive "K&M" FLUID-TITE Coupling is root-tight, water-tight, with self-energizing rubber coupling rings. Unskilled labor can assemble it in any weather, without heavy machinery. It allows deflection up to 5°.

FROM KEY WEST TO L.A.

Modern communities are joining the trend to the modern pipe—

"K & M" ASBESTOS-CEMENT PRESSURE PIPE with FLUID-TITE COUPLING

• Permanent, root-tight, water-tight connections • Non-tuberculating • Non-electrolytic • Corrosion-resistant • Longer sections—fewer joints • Pumping costs remain low • Your low first cost is often your last cost.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

of nearly $56 million compared with the amount appropriated for 1959, and $226 million more than was appropriated in 1958.

The White House also asked Congress for increased funds for hydrologic studies including investigations of storms, rainfall, streamflow, sedimentation, and operation of water control structures. Funds likewise are proposed for the continued construction of the Mississippi Basin Waterways Experiment Station, at Vicksburg, Miss. Initial objectives of this basin-wide testing program are to improve the operation of the reservoir system in the Mississippi River Basin, to assure optimum operation of the reservoir system, and to study potential flood levels.

There are only two drainage basins in the world greater than the Mississippi – the Amazon in South America and the Congo in Africa. The Mississippi watershed is 140,000 square miles larger than the Nile, twice the size of the Volga, and three times larger than the Ganges.

New Bills

There is a series of pending proposals of marked interest to consulting engineers on Capitol Hill. Several appear destined to be passed this year, though some may be held over.

Measures that seem to have a favorable chance of passage include loans and grants to aid areas of chronic unemployment, a six-year program of urban renewal capital grants, a four-year program of grants for construction of civil airport facilities, and a program (which in some aspects is not attractive to consultants) to provide bond financing for Tennessee Valley generating facilities.

Power Generating Capacity

The Federal Power Commission estimates that by 1980 this country's present enormous power generating capacity will have to be nearly tripled. Government officials estimate that to provide this increase more than $100 billion will have to be invested in generating, transmission, and distribution facilities. Consulting engineers in Washington agree that expanding power facilities are needed to provide for the growing use of air conditioning, lighting, heating, and irrigation.

Salt Water to Fresh

Congress has before it recommendations of a special survey team calling for accelerated research and more action by those working on ways to make salty and brackish water fresh. The survey team made 23 specific recommendations to Secretary of the Interior Fred A. Seaton, who has jurisdiction over the Office of Saline Water. With the fresh water table continually dropping in this country, the report advocates an enlarged research and development program im-

Are you wasting all kinds of time selecting the right wire and cable for your job?

MEET THE MAN WHO CAN HELP YOU...

. . . on page 32

PUMPS ON YOUR MIND?

Send for this VIKING Pump Data

VIKING ENGINEERING DATA A 36-page pump engineering manual is yours for the asking. It fully explains the 10 easy steps in selecting Viking rotary pumps. Ask for catalog KP.

VIKING HEAVY DUTY PUMPS Available in 10 to 1050 G.P.M. sizes, these rugged Vikings are suitable for pressures up to 200 PSI. Complete with specifications, performance data, etc., they are illustrated in the 24-page catalog CP.

VIKING GENERAL PURPOSE PUMPS These Viking Pumps — in ⅔ to 1050 G.P.M. sizes — are suitable for pressures up to 100 PSI. They are fully illustrated and have specifications, performance data, etc., in the 36-page catalog BP.

All Viking Pumps are positive displacement pumps and deliver either thin or thick liquids.

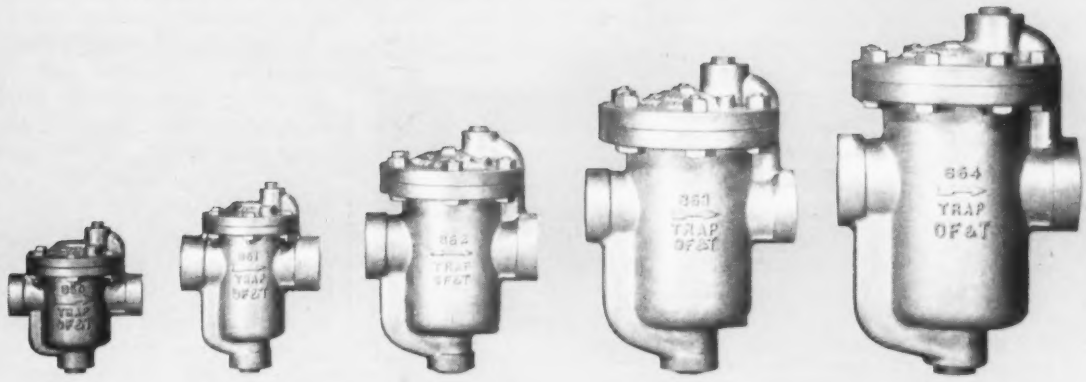
VIKING — the leader, not a follower, in Rotary Pumps

VIKING PUMP COMPANY
Cedar Falls, Iowa, U.S.A. In Canada, it's "ROTO-KING" pumps

See Our Catalog in Sweet's Industrial Construction and Plant Engineer's File

ANNOUNCING a Complete New Line . . .

ARMSTRONG Open Float and Thermostatic Steam Traps



Designed and Made by Armstrong Especially for Low Pressure Heating Service

Armstrong Open Float and Thermostatic Traps are the result of the demand by user-owners and contractors for an effective, trouble-free steam trap for heating service.

How They Work

When the steam is first turned on, Armstrong O.F.&T. traps quickly vent the air that has accumulated in the heating units. After start-up, the traps will vent air and CO_2 gas at steam temperature to prevent corrosion of unit heater tubes and other types of finned radiation. Condensate is removed as fast as it accumulates without loss of steam.

Advantages of Armstrong O. F. & T. Traps

The design and construction of Armstrong Open Float and Thermostatic Steam Traps provides outstanding benefits to both the owner and the installing contractor:

LOW COST is made possible by simple, compact design and large volume production.

EASY INSTALLATION. Pipe connections are horizontal and opposite. Traps are supported by the connecting pipes.

INTERNAL CHECK VALVES of 18-8 stainless steel can be furnished with the traps to save cost of installing external check valves.

YEARS OF SERVICE LIFE . . . Working parts are all stainless steel, highly resistant to both corrosion and wear.

MINIMUM MAINTENANCE . . . comes not only from the use of stainless steel parts, but also because the trap is self-scrubbing. Ordinary sediment and sludge are washed right through with the condensate.

Further Information Available

If a trap with these features is of interest to you, get in touch with your nearby Armstrong Representative. Ask him for Bulletin 775 which gives price, dimension and capacity data, or use the coupon below.

ARMSTRONG MACHINE WORKS
9652 Maple Street • Three Rivers, Michigan

FREE BULLETIN
No. 775 gives detailed information on Armstrong O.F.&T. traps.

ARMSTRONG MACHINE WORKS
9652 Maple Street, Three Rivers, Michigan

Please send a copy of Bulletin No. 775.

Name_____

Company_____

Street Address_____

City_____ Zone____ State_____

mediately. The experts recommend that an assistant director be appointed to the Office of Saline Water; that full advantage be taken of technical developments in saline water research in other countries; that the Office of Saline Water make studies of the cost and price of water for selected cities preliminary to making a longer range market survey for water.

In accordance with the authorization during the 1958 Congress, the Interior Department is establishing five conversion plants in as many sections of the United States in an effort to achieve an early break-through and bring the conversion cost down to about 60 cents per 1000 gallons. Present costs are over $1 per 1000 gallons.

A pilot plant designed to convert daily 15,000 gallons of seawater into fresh water is being built by the Carrier Corporation, for the Interior Department. When completed, the $150,000 plant, which will use a direct-freeze process, will be moved to a sea coast site in connection with the stepped up experiments.

Drop in Engineering Enrollments

One of President Eisenhower's Cabinet officers, Arthur S. Fleming, is disturbed over the decline in engineering enrollments during the current academic year after a steady increase for seven consecutive years. The Secretary of Health, Education, and Welfare said total engineering undergraduate enrollment last fall was 256,995 as compared with 268,761 for the corresponding period during 1957, a decrease of 4.4 percent.

Some engineers in the capital maintain that the gradual rise, before the drop, was brought about by the nationwide publicity campaign of the government and others to get more students to study engineering. Some said the decline probably was caused by published reports that the shortage of engineers had been exaggerated.

International Standardization

The English-speaking nations, which have gotten together at last on the common inch and the common pound, will continue working toward ultimate adoption of the common gallon. The Bureau of Standards insists that the standard United States gallon and the Imperial gallon are so different that a compromise was not practicable during conferences last year. The United States gallon is defined as equal to 231 cubic inches. The Imperial gallon is defined as the volume of 10 pounds of water under standard conditions of temperature and pressure.

The English-speaking countries have agreed, however, to adopt an international yard and an international pound. The international yard equals 0.9144 meter; the international pound equals 0.45359237 kilogram. ▲▲

from the other* GOODYEAR RUBBER COMPANY

Where constant maintenance of pressure is essential, pneumatic seals are vital. We manufacture such seals for numerous purposes and operating conditions. Some big enough to seal the shells of a wind tunnel. We also manufacture to specification highly precise rubber products for all industries.

WRITE FOR OUR NEW BROCHURE "RUBBER PRODUCTS FOR INDUSTRY."

*In fact . . . the original! Established 1872, we have no connection with the firm that makes auto tires.

GOODYEAR RUBBER COMPANY

2400 THIRD STREET • SAN FRANCISCO, CALIFORNIA

TODD

EXTRA YEARS

of more dependable power

and at less cost per pound of steam

TODD BURNERS

OIL, GAS, OIL-GAS

TODD

SHIPYARDS CORPORATION

PRODUCTS DIVISION

SALES AND SERVICE DEPARTMENTS

Columbia & Halleck Streets, Brooklyn 31, N. Y.

PLANT, SALES AND SERVICE

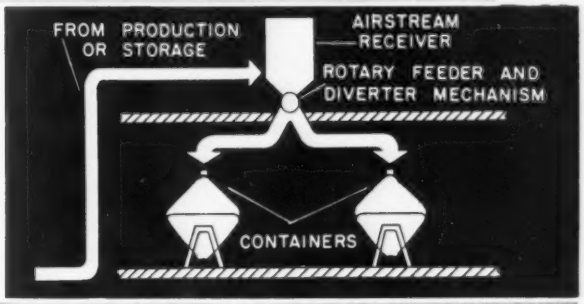
Houston, Texas

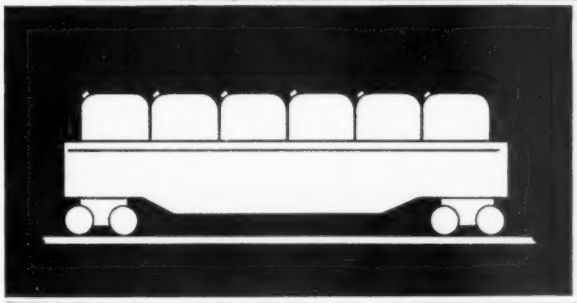
a new concept in high-purity bulk handling!

Dracco *Airstream* conveyors + collapsible containers

Shipping, receiving and storing high-purity materials in collapsible rubber containers has streamlined between-plant bulk handling. Now Dracco has adapted its advanced pneumatic conveying techniques to this important new method, providing a thrifty combination of automation and sanitation which maintains the highest standards of product purity.

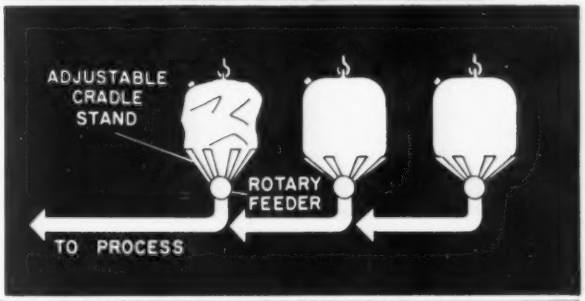
Load containers directly from production or storage with Airstream Conveyor System. Handling is fast, automatic, completely enclosed. One-man supervision saves labor costs.





Ship via rail, truck or barge. Store outside until contents are needed. Containers are air-tight, weather-proof, reusable.

Unload and distribute material to process with Airstream Conveyor System. No loss or waste. Material is never exposed to moisture or contamination.



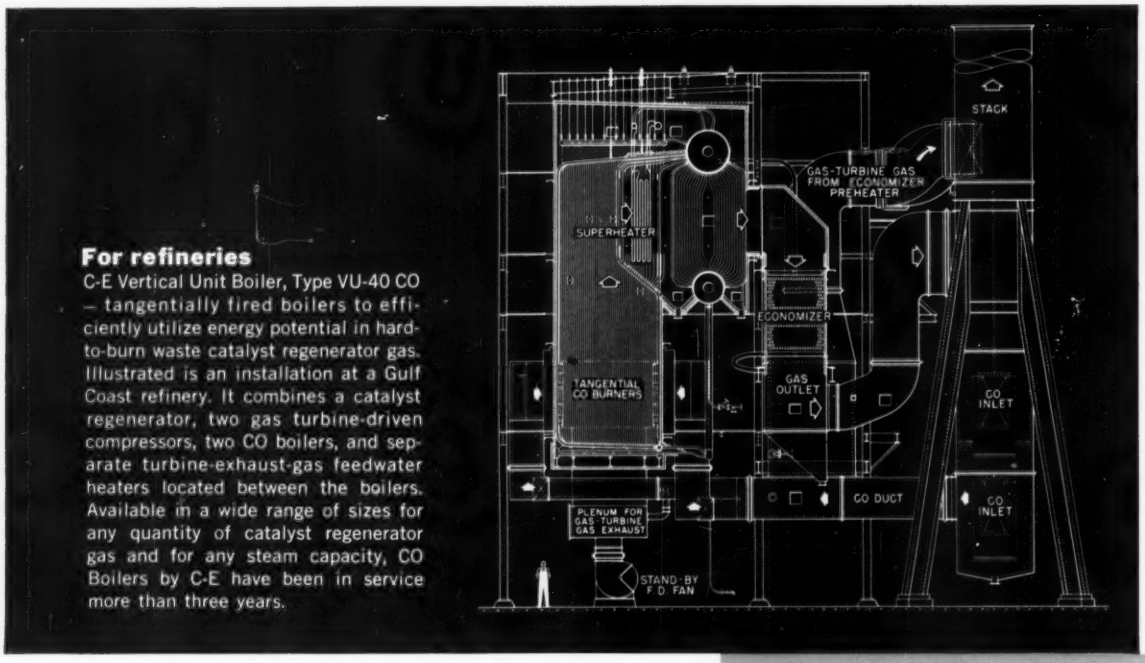
Automatic Airstream Conveyors can be teamed up with all types of portable containers to introduce faster, better handling at less cost. Write or call for further information.

DRACCO DIVISION OF FULLER CO. **4030 East 116th Street • Cleveland 5, Ohio**

Details on this new concept are presented in a new 12-page report "New Techniques for Automatic Bulk Handling", now available from Dracco.

DRACCO *airstream* conveyors
dust control equipment

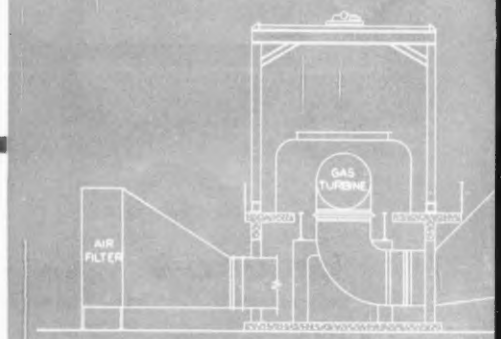
(Pronounced Dray'co)

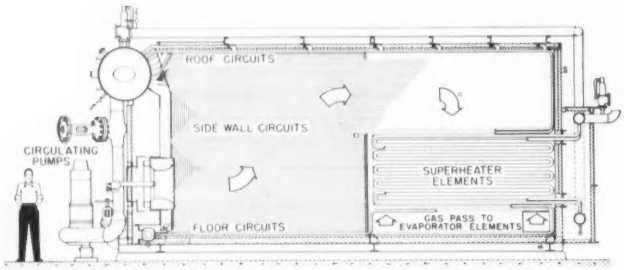


For refineries

C-E Vertical Unit Boiler, Type VU-40 CO – tangentially fired boilers to efficiently utilize energy potential in hard-to-burn waste catalyst regenerator gas. Illustrated is an installation at a Gulf Coast refinery. It combines a catalyst regenerator, two gas turbine-driven compressors, two CO boilers, and separate turbine-exhaust-gas feedwater heaters located between the boilers. Available in a wide range of sizes for any quantity of catalyst regenerator gas and for any steam capacity, CO Boilers by C-E have been in service more than three years.

Special boilers for special





For diverse industrials

C-E Package Boiler, Type PCC—new, completely shop-assembled, high performance, Controlled Circulation steam generator. Now in service with capacities to 120,000 lb/hr, it is available with temperatures to 900 F. and pressures to 1,000 psi (or higher if desired). This boiler is especially suitable where maximum capacity, temperature, and pressure are required, yet space is limited. Offers easy handling of rapid load swings and high quality steam production. PCC's in service include the world's highest capacity, highest pressure, and highest temperature package boilers.

C-E builds boilers of virtually all designs and types known in present practice . . . in capacities from less than 10,000 to 4,000,000 or more lb. of steam per hr. It is presently building units that will set new world records for capacity, pressure and temperature.

This vast experience has also been successfully applied to the development of many special designs to utilize waste fuels or to meet unusual steam requirements or space conditions.

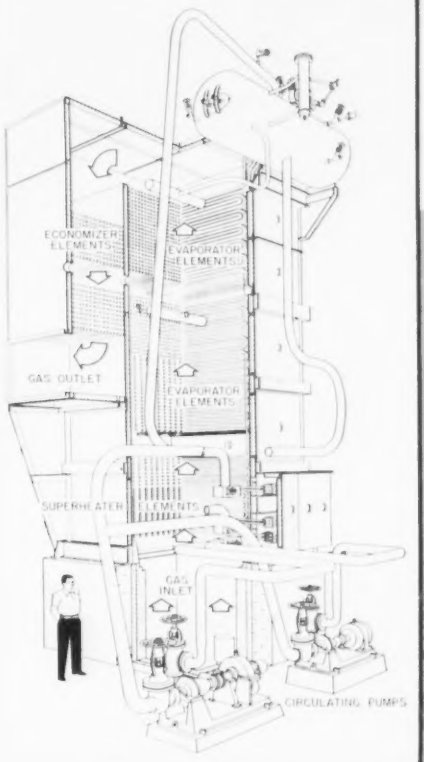
A few recent examples of special C-E designs which have successfully met unusual problems are illustrated here. In several cases, this success may be attributed to the utilization of exclusive C-E developments such as controlled circulation or tangential firing.

Whether your requirements call for boilers of unusual characteristics, such as those shown here, or for more conventional standard designs, come to C-E where you'll find the skill, experience, facilities—and desire—to meet your needs *exactly*.

needs – by C-E

For the steel and chemical industries

C-E Package Boiler, Type WCC – a Controlled Circulation design which utilizes waste heat from open hearths or chemical processes. The platen surfaces featured in the first pass permit passage of abrasive or "sticky" gas without erosion or bridging, prolonging boiler life and making the unit easier to clean. Controlled Circulation assures positive control of water to all circuits, permitting a smaller boiler with obvious space-saving advantages. Seven WCC's are now in service; eight others are being erected.



For gas turbine installations

C-E Gas Turbine Boiler—waste heat design for economical utilization of gas turbine exhaust sensible heat. Usable in a choice of cycles to obtain fired or unfired heat recovery and steam generation. Illustrated is a combined cycle, two of which are in service at a chemical plant. Here the turbine is followed by a waste heat boiler, multiple-purpose economizers (process and feedwater), and a conventional oil-fired steam generator which uses a portion of the high temperature exhaust gas for combustion air.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

C-175

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

Mahon M-FLOOR Construction

FIRST NATIONAL BANK BUILDING
Minneapolis, Minnesota

ARCHITECTS and ENGINEERS:
Holabird & Root & Burgee, Chicago, Illinois
Associate Architects:
Thorshov & Cerny, Inc., Minneapolis, Minn.

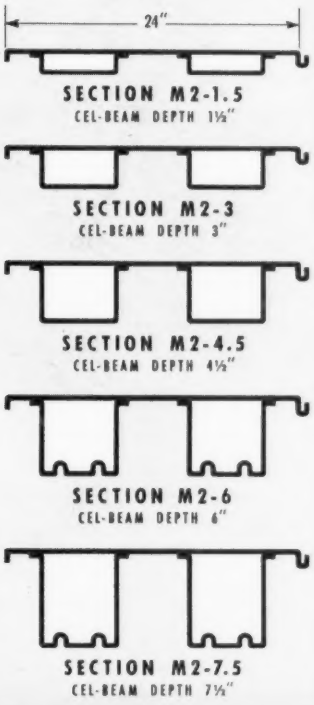
GENERAL CONTRACTOR:
Naugle-Leck, Inc., Minneapolis, Minn.

Sectional View of an Electrified Cellular Steel Floor Constructed with Mahon M-Floor Section M2-4.5, and Energized with a Three Header Duct Electrical Distribution System.

Safeguards This Imposing Structure Against Electrical Obsolescence!

Mahon M-FLOOR Cel-Beam Sections Provide Electrical Raceways Under Every Square Foot of Floor Surface

MAHON
M-FLOOR SECTIONS



A BETTER BALANCED, MORE EFFICIENT SECTION FOR ANY STRUCTURAL REQUIREMENT

☆ OTHER MAHON BUILDING PRODUCTS and SERVICES:

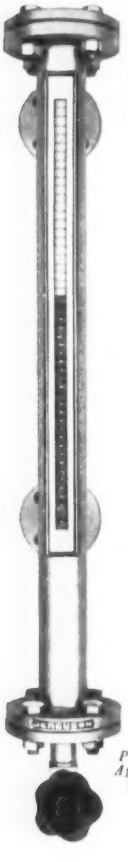
- Insulated Metal Curtain Walls
- Underwriters' Rated Metalclad Fire Walls
- Rolling Steel Doors (Standard or Underwriters' Labeled)
- Steel Roof Deck
- Long Span M-Decks (Cellular or Open Beam)
- Permanent Concrete Floor Forms
- Acoustical and Troffer Forms
- Acoustical Metal Walls and Partitions
- Acoustical Metal Ceilings
- Structural Steel—Fabrication and Erection
- Steel Plate Components—Riveted or Welded

☆ *For INFORMATION See SWEET'S FILES or Write for Catalogues*

THE R. C. MAHON COMPANY • Detroit 34, Michigan
Sales-Engineering Offices in Detroit, New York and Chicago
Representatives in all Principal Cities

MAHON

Announcing
the New
Jerguson
MAGNETIC GAGE
For Liquid Levels



An important advancement in liquid level observation for plants with dangerous explosive or inflammable conditions.

Safety design seals against escaping gases.

Measuring mechanism in stainless steel chamber.

Scale mounted outside chamber; magnetically actuated through chamber wall.

Distinct, accurate level shown in red contrasted with silver above.

Job designed, correlating pressure, temperature, and specific gravity.

Available with electric alarms.

Patent Applied For

Can also be used for interface indication.

Write now for engineering sheet on Jerguson Magnetic Gages.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY
100 Adams Street, Burlington, Mass.
Offices in Major Cities
In Canada: Peacock Bros. Ltd.

Field Notes

MARJORIE ODEN
Eastern Editor

"YOU CAN'T BEAT the laws of physics, so you might as well use them," 350 acoustical experts, engineers, architects, and materials suppliers were told at a recent Building Research Institute conference on acoustics.

Some of the most prominent consulting engineers in the country were at the New York City conference to suggest ways to control noise – an increasing source of annoyance in modern buildings. Among those on the program were Robert B. Newman, vice president, Bolt, Beranek and Newman, Cambridge, Mass.; Alfred L. Jaros, Jr., partner, Jaros, Baum & Bolles, New York City; Lewis S. Goodfriend, Lewis S. Goodfriend & Associates, Montclair, N. J.; Richard Hamme, president, Geiger & Hamme, acoustical consultants, Ann Arbor, Mich.; Howard C. Hardy, Howard C. Hardy & Associates, Chicago; and B. G. Watters, engineer, Bolt, Beranek & Newman.

The experts agreed that the aim of engineers is to control, not eliminate, noise. It was pointed out that it is almost impossible for a person to work surrounded by silence. "Acoustical perfume" may be the answer. About the equivalent of using perfume instead of bathing, this involves the substitution of pleasing sounds for irritating noises.

An equally simple solution to some noise problems is the removal of the noise source. As the speakers pointed out, it sometimes is more economical to house mechanical equipment at a distance than to install elaborate and expensive noise controls.

Ventilation System Noise

In a discussion of ventilation system noise, Hardy pointed out that the increasing use of air conditioning has intensified the problem of the acoustic design of ventilation systems. Not only has the amount of equipment increased, but "mechanical engineers also are tempted to try new combinations of systems with occasional disastrous acoustical ramifications."

Hardy described a large concert auditorium in the Midwest. Knowing this auditorium was a monumental design, the mechanical engineers specified a ventilation system of ceiling air distribution using a series of jets. Noise was distributed evenly, but best described as "water is running somewhere."

There is a large manufacturing office adjoining a factory. The engineers on the office building decided to use a high velocity exhaust system and took no action to control the noise. "The noise environment in every space of the building is quite similar and consists of an intense low frequency rumble, not unlike that heard a few miles from Cape Canaveral on a busy morning," Hardy added.

To avoid these acoustical catastrophies, Hardy said that "after the design goal has been set, the general technique used in engineering the system is to take the sound power contributed by the various noise sources and compute the

No. 12 in a series

Right off the Wire

1. A new teletypewriter can print 3,000 words a minute and has a theoretical top speed of 500,000.

2. Work has begun on a pilot model of a device for generating electricity from the controlled fusion of hydrogen at a temperature of about one hundred million degrees.

3. A new industrial pump has a piston that moves only a fraction of an inch, but at the rate of sixty cycles per second. It has no outside openings and cannot leak.

4. The "world's first" atomic house heating installation is being built underground in a suburb of Stockholm.

5. "Hydrogasification" is a one-step process that produces gas directly from oil shale with an efficiency of over ninety per cent.

6. A radar target made for small boats reduces the risk of their being run down by large vessels and also makes it easier for them to be found when in distress.

7. Heat radiation in amounts as small as one-twentieth of a billionth of a watt can be detected by a new instrument.

8. A traffic signal on wheels is battery operated and can be set up anywhere.

9. Tire treads made of a new synthetic rubber are said to be forty percent more durable than those made of natural rubber.

10. Power is transmitted to two of the world's largest coal-digging machines through 3 conductor, 7500-volt, Simplex TIREX shovel cables.

11. One hundred and twenty-five skilled workers will be replaced by a new automatic tester for transistors which will also make fewer errors.

12. A new metal-working plant will be air-tight and metals will be fabricated at high temperatures in an atmosphere of argon.

13. A three-dimensional mobile radar shows the direction, distance and height of aircraft.

14. A battery charger for outboard motors uses the generator of the towing car while the boat is on the trailer.

15. Earphones that cancel outside noises by creating neutralizing sound waves are being used experimentally by the Army.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

16. Homes may be lighted, heated and cooled electrically by means of a type of panel now being developed.

17. A reading aid for the blind translates each printed letter into a different musical note.

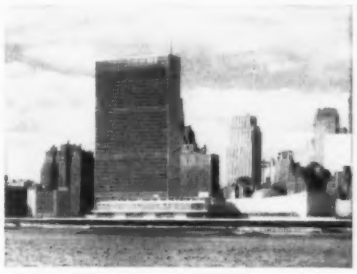
18. An underground hospital is to be built which will have 650 beds. It is to be completed in 1960.

19. Molten sulphur will be pumped up from a depth of 2,000 feet under the floor of the Gulf of Mexico. The installation is being made seven miles off the Louisiana coast and the liquid will be pumped to shore for refining.

20. New gallery-type railroad passenger coaches and parlor cars are being used for medium-haul service. The bi-level streamliners, designed for high capacity and low weight per seat, use Simplex Car Wire throughout.

21. Growing under artificial sunlight, a new strain of algae multiplies a thousandfold in a day.

22. Fungi may have been the first living space travelers. It has been found that some spores can exist in a vacuum equal to that in interplanetary space.



Transatlantic Concert

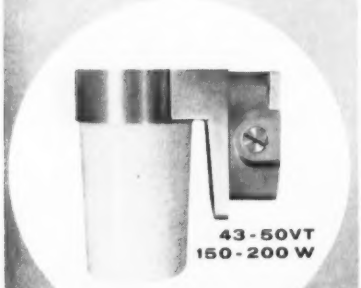
One of the most notable musical events of all time took place recently at the United Nations building in New York. The concert, featuring the Boston Symphony Orchestra and distinguished musicians from Paris and Geneva, was highlighted by the performance of Pablo Casals, world-famed violincellist. This epochal musical treat was telephoned to seventy-five countries by the Bell System, over the transatlantic submarine cable, the American portion of which was made by Simplex.

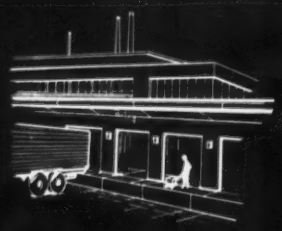
SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining • Power & Lighting • Construction • Transportation • Communications • Signalling

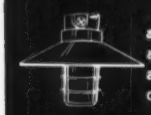
new
from
mc Philben
200 watt vaportights



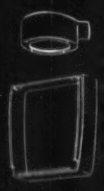


cast aluminum quality . . . anodized for corrosion resistance . . . superb designs that are competitively priced. 100-150-200 watt sizes . . . 40% larger tapered globes that operate cooler, last longer and need less maintenance.

Ask your McPhilben representative for full details on the new 43-50VT series. See our insert in Sweet's or write to McPhilben. Ask for Folio 58-7.



also ceiling units aluminum reflector and cast guards optional



surface junction boxes for both ceiling and wall mounting when exposed conduit is required.

mc Philben
LIGHTING INC., BROOKLYN 37, NEW YORK
IN CANADA: DIVISION OF
WAKEFIELD LIGHTING LIMITED
LONDON, ONTARIO

sound power which arrives at a particular working space. Knowing the acoustical characteristics of this space, one then computes the sound level and compares it with the design goal. One then can decide what noise control measures will be necessary and prescribe either the point in the system where they should be installed or what flow changes will be needed to obtain the required noise environment."

Several of the papers, including Hardy's, mentioned that adequate noise power ratings for equipment are not available – and there still is confusion concerning acoustic terminology and measurement.

"Several companies now are issuing data, and many more are planning to release data in the near future. The air motion industry also is preparing a standard for noise measurement based on this scheme of obtaining data. It is hoped that in the future manufacturers will be supplying noise data as conscientiously as they now are giving air flow and pressure drop data," Hardy concluded.

Specifications Important

Jaros offered pointers on the control of noise (from air conditioning and other mechanical equipment) by specification writing. Giving a number of excerpts from specifications to illustrate, Jaros began by cautioning that "It is important to decide who will pass on the [noise level] acceptability of the results." And when alternates are permitted, the control of the architect or engineer should be retained so the intended results are not voided by acceptance of makes of equipment other than those specified by the engineer.

Particularly in the case of air handling units and systems, proper testing and adjusting (upon completion of the installation) is an essential factor in securing the intended results. Jaros added that the testing program should be handled by the contractor's personnel, but by men "not actively engaged in the task of installing this system.

"Under no circumstances shall any air handling system be used as a source of temporary heat until the building has progressed to a point where no dust, dirt, or rubbish are on the premises served by the air handling system," Jaros continued. "Much annoying noise can result from sand or small particles being propelled in ductwork."

The construction of ductwork, especially in high-pressure and high-velocity systems, is important. Ducts that are too frail (or inadequately braced) may rattle. Duct joints that leak may whistle. Ducts that are not correctly shaped at turns, splitters, and branches may produce turbulence that will add noise. If the hanger is anything other than a round rod, it also can cause extra noise. Leakage can not only upset the desired air quantities, but bring noise.

Jaros also stated that pressure reducing valves for high and medium pressure duct systems must not only regulate the air quantity and pressure properly, but must do so with a minimum of turbulence.

"It is most important to specify in some detail the attenuators on the leaving side of such reducing valves; these can be simpler than those at the outlets of main high-pressure fans, but they are still a necessary detail in elimination of needless sound in rooms."

Human Relations

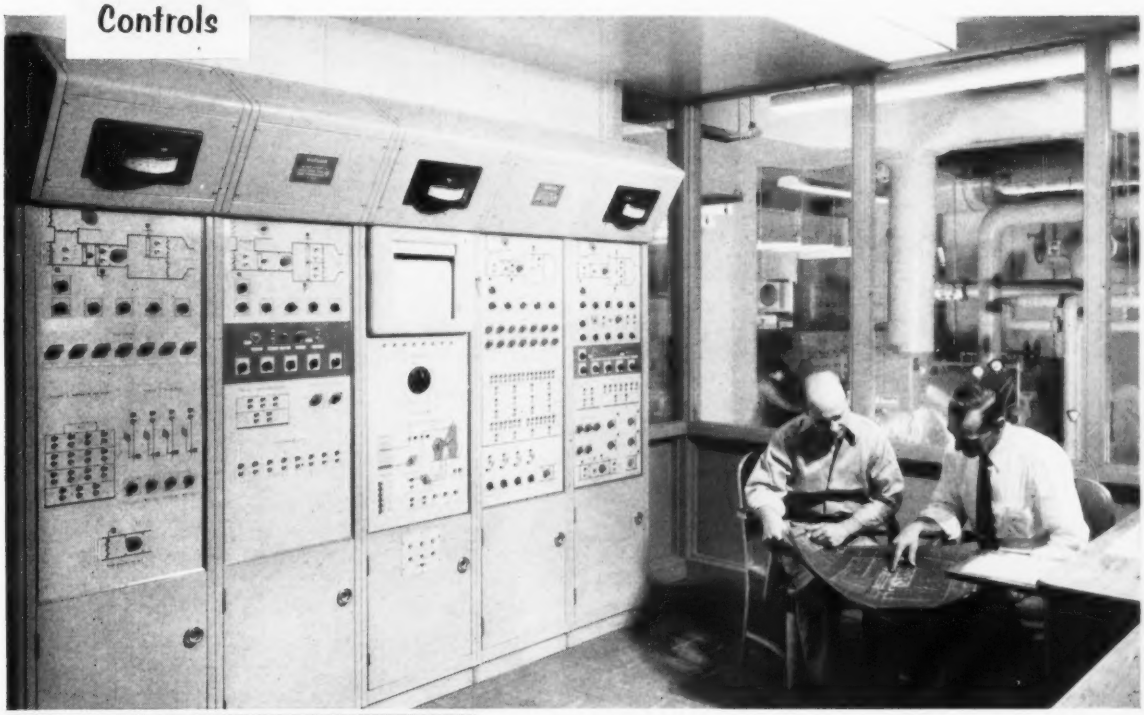
Goodfriend described "The Effects of Noise on People." Although he has observed the consumption of amazing quantities of aspirin, Goodfriend said he has noticed that office workers can maintain high work levels despite extraordinary noise conditions. The unwanted noise, however, often results in excessive end-of-the-day fatigue on the part of the employees and a feeling of apprehension on the part of individual employees for their future health and peace of mind. Another frequent and unfortunate

THE MARK OF QUALITY

BARBER COLMAN

Automatic Controls

Centralized remote control completes an air conditioning system



International Mineral and Chemical Corporation office building recently completed at Skokie, Illinois. Complete control of air conditioning throughout five interconnected buildings is provided by a five-module Barber-Colman "Electrionic" Remote Control Center.

The center provides one-man supervision for all major fans and circulating pumps, and permits remote temperature indication and adjustment for all zones. A multipoint recorder is provided for system analysis and permanent recording of equipment performance for future reference.

Architect and Engineer: Perkins & Will, Chicago, Ill.; Mechanical Contractor: M. J. Corboy Corporation, Chicago, Illinois; Air Conditioning and Ventilating Contractor: Robert Irsay, Skokie, Illinois.

With centralized remote indication, adjustment, and recording, the system accomplishes what it is designed to do — deliver continuous complaint-free comfort, efficiently and economically.

Management and operation of the entire system is put under the visual supervision of one operator who can readjust thermostat settings to meet changing tenant requirements. This eliminates the constant up-and-down temperature pattern common in building areas where everyone has access to the thermostat. Lower cost is achieved through simplified operation and maintenance. All control components and circuitry are located in the control panel where they are easily accessible in the event maintenance is required.

Floor layouts and systems are shown schematically on the centralized panel. By simply pushing a button, the operator can instantly read the temperature at any location and adjust comfort conditions by means of convenient remote controls.

Not only does centralized remote control provide simple operation and maintenance, it also makes the designer's and installer's job easier. All conduit and wiring are run to one central point for hookup to the factory-assembled "Electrionic" Control Center. The only remotely located elements in the control system are the dependable electronic room thermostats and motor operators.

Thus, remote control *completes* the system, assuring continuous, uniform comfort, for which this system was specified and purchased in the first place.

For all of the facts, ask for Bulletin F8944. Call your local Barber-Colman field office or write:

BARBER-COLMAN COMPANY

Dept. O, 1360 Rock Street, Rockford, Illinois • Field Offices in Principal Cities

result of excessive noise is lawsuits.

"There is one condition under which higher noise levels than those recommended as design objectives may be tolerated. This is when the period of time during which the noise is present is small and occurs only during the day or early evening," Goodfriend added.

The User's Viewpoint

"The Building User's Problem" was highlighted by Julius E. Weinhold, director, physical plant, Cornell University.

"Since there seems to be a very strong trend, for economic reasons, to construct buildings with exposed masonry block partitions, many of our problems are in connection with that type of design," Weinhold said. "Recently a consultant, investigating the acoustical characteristics claimed by a large manufacturer of cement blocks for his product, found that this company had made no tests and the figures were arrived at by taking a good look at published data for similar products and then estimating what might be fair coefficients for its own product. In a publication of the Lightweight Concrete Products Industry I found this statement: 'Walls of this material absorb sound. The acoustics of large rooms are substantially improved by the reduction of sound reverberation. Privacy is insured by practically eliminating transmission of sound.' I am sure that a large number of us would not agree with the accuracy of that statement."

Sound Transmission

Another problem of the consultant dealing with acoustics was covered by Watters in his discussion of "Control of Transmitted Sound Over and Around Partitions."

Watters pointed out, "We don't know what to ask for." For example, a consultant will specify "40 db transmission loss" between walls. Maybe what he really needs is only 20 db, or it might be 50 or 60 db in an especially tough acoustic situation.

"Another reason buildings are built with substandard acoustics is that even when we know what to ask for, we often don't use the right words," Watters continued. "The numbers 50 db, 40 db, and 20 db usually refer to average transmission loss values. To get an average value, we lump together the wall's performance at the low sound frequencies, the mid frequencies, and the very high frequencies. A couple of years ago, Richard Waterhouse of the Bureau of Standards wrote, and I quote, 'The arithmetic average of decibel sound transmission loss values at the different frequencies often is used, but it generally is agreed to be far from perfect.'"

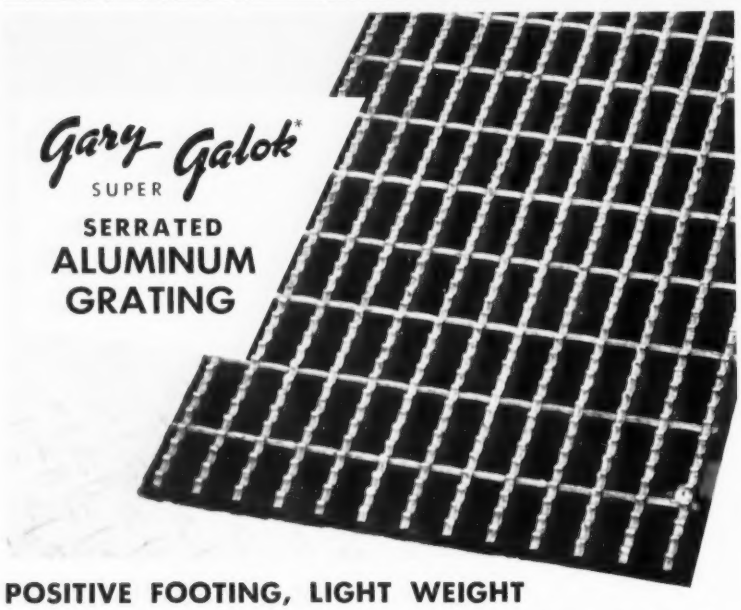
Even when the consultant knows what he wants and how to describe it, acoustic privacy complaints may arise because accurate test data may not be available. Walls sometimes behave differently when in-

Are you making a lot of frantic phone calls when a single call to the right man would serve all your wire and cable needs?

MEET THE MAN

WHO CAN HELP YOU...

. . . on page 32



POSITIVE FOOTING, LIGHT WEIGHT

Serrations scientifically designed to provide maximum positive footing and traction. High strength to weight ratio, minimum deflection, maximum safety, corrosion resistant. Bars cannot turn, twist, loosen or fall out. Write for complete details. Bulletin GE 39

*Patents Pending

Gary SUPER Galok aluminum grating also available with plain bars. Both the serrated and plain types in sizes for every need.

ROCKWELL R STANDARD

ROCKWELL-STANDARD
CORPORATION
GRATING DIVISION
4015 E. Seventh Ave., Gary, Indiana

THE NIBCO FORMULA for wrot copper fittings is the result of continuous research and the experience gained from decades of manufacturing

Wrot fittings

that are *just right!*

Not too thick, not too thin . . . NIBCO wrot copper fittings heat quickly for fast assembly. And, they exceed strength requirements of recommended standards* by more than *six times!* They exceed the required copper content by more than 15%, as well.

Whether you specify copper systems or install them, you'll appreciate the satisfaction of using wrot copper fittings you know are *just right.* Fittings by NIBCO are available from leading wholesalers throughout the nation.

SEND FOR CATALOG "I"
NIBCO INC., Dept. J-6703
Elkhart, Indiana

NIBCO

*American Standard ASA B16.22—1951

stalled in a test laboratory than when installed in the field. And when this happens, the laboratory performance usually will be superior to the field performance. "Although the testing laboratories are aware of these problems, the solutions are yet to be worked out. Until they are, be wary of test values for relatively stiff partitions, especially when the test panel is small.

"Actually, we expect too much from partitions. What is desired is a panel light enough to be moved by one man and stiff enough to make a good diving board."

Watters added that even the best wall will not do much of a job if it is bypassed by the usual shrinkage cracks, openings behind connector covers, and back-to-back electrical outlets. "And if past experience is any guide, then the odds are about two to one that the next wall you build will be seriously compromised by one or more of these typical types of air leakages." But he had a simple solution for finding leaks: "Before a new room is put into service, place a noisy vacuum cleaner in one room and go next door and listen. You will find your leaks in one-tenth the time it would take you to locate them with your eyes. If you want to look real professional while hunting, then get a stethoscope and probe along the edges of the wall and at other likely spots."

Suspended Ceilings

Hamme, discussing "Sound transmission Through Suspended Ceilings Over Part-High Partitions," pointed out that suspended acoustical ceilings over large expanses (subdivided by part-high partitions) may have advantages with respect to lighting, ventilation piping, and future mobility. But acoustical problems are created. Recognizing these problems, the Acoustical Materials Association began two years ago to devote a substantial part of its research funds to a study of sound transmission characteristics of suspended acoustical ceilings.

Hamme also pointed out that over-emphasis is placed on a partition's materials in comparison to peripheral leakage. "The performance of a ceiling may depend crucially on the details of the method of suspension as well as the selection of the materials."

Sponsors

Sponsors of the meeting were the Acoustical Materials Association, Anemostat Corporation of America, Armstrong Cork Co., Baldwin-Hill Co., E. F. Hauserman Co., International Business Machines Corp., Johns-Manville Corp., National Gypsum Co., Owens-Corning Fiberglas Corp., and Rollform Inc. BRI is a part of the National Academy of Science. Its members are engineers, architects, manufacturers, contractors, and others interested in construction. Many prominent consultants are members. ▲▲

PERMACRETE PRE-CAST CONCRETE CROSSING SLABS

SECTION THROUGH TRACK

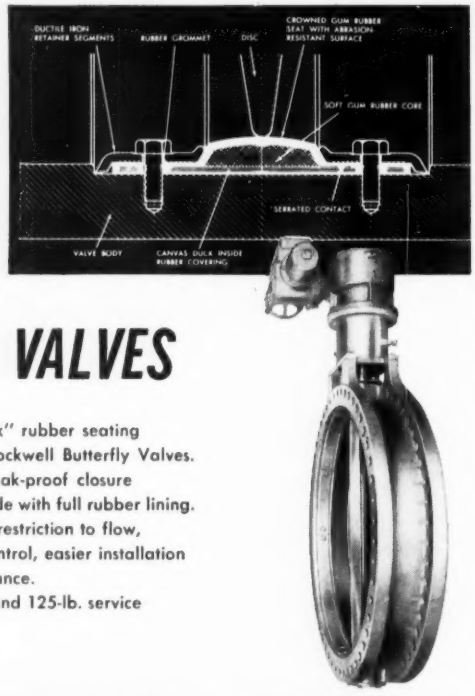
Insure Long Lasting, Smooth Riding and Maintenance Free Industrial Crossings

WRITE FOR BULLETIN 1058

PERMACRETE PRODUCTS CORPORATION

1839 South Wall St. • Columbus 7, Ohio

DRIP-TIGHT SHUT-OFF *with* ROCKWELL *BUTTERFLY VALVES*



The matchless new "Wedge-Lock" rubber seating provides drip-tight shut-off in Rockwell Butterfly Valves. Its unique construction makes leak-proof closure sure and safe. Valves can be made with full rubber lining.

Other advantages—minimum restriction to flow, positive manual or automatic control, easier installation in less space, minimum maintenance.

Made in all sizes, in 25-, 50- and 125-lb. service in all industrial applications.

Write for Bulletin 582.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

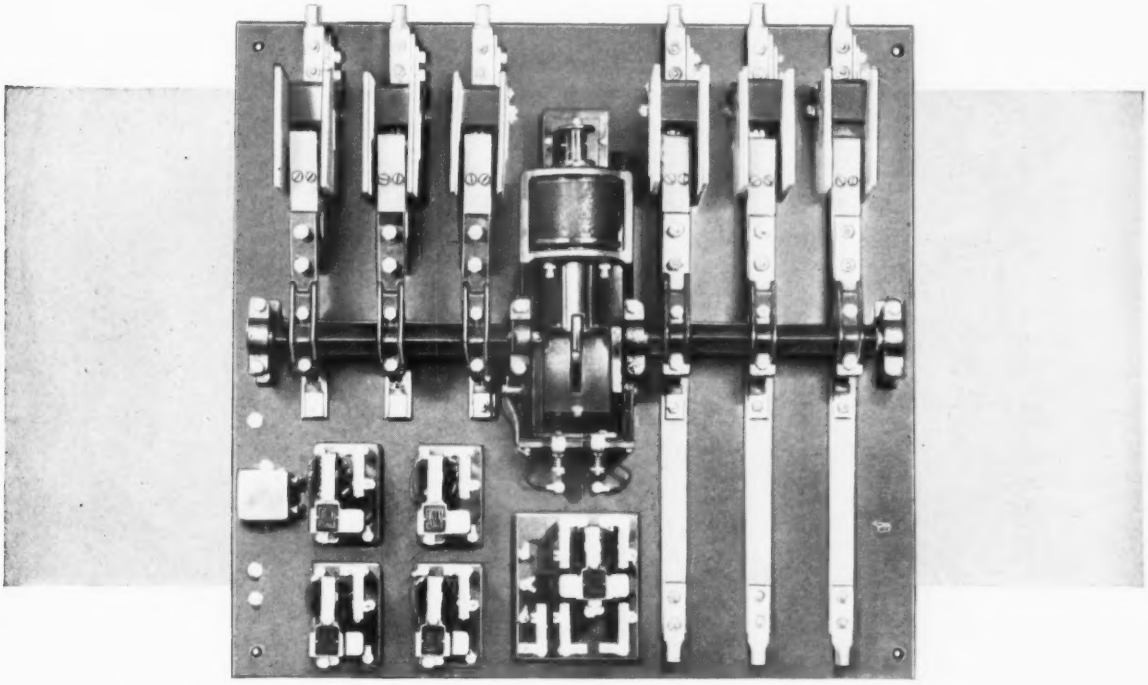
Valves – Butterfly · Slide · Diaphragm · Special

2469 Eliot Street • Fairfield, Conn.

NUMBER 9 OF A SERIES

...WHY you should insist on Built-in Time Delay when specifying an Automatic Transfer Switch

Utility company experience tells us that normal power source distribution feeders are subject to occasional harmless momentary dips and outages, caused mostly by faulty loads, accidental grounds and electrical storms. When these last less than one second, they can be ignored. Yet, any one of these fluctuations can activate a transfer switch, causing false starts by the emergency power plant—*unless there is a built-in time delay.*



ASCO built-in Time Delay prevents false starts

ASCO Transfer Switches may be provided with built-in time delays, factory set for tripping at any point between 1 and 3 seconds. This delay permits the transfer switch to ignore momentary outages caused by transient conditions, resulting in smooth handling of the connected load, and reduced wear and tear on starting mechanisms. ASCO pioneered and still effectively employs this built-in feature on Automatic Transfer Switches.

Time Delay—with no Moving Parts

Time Delay is "built in" to the circuit selector relay; no extra relays or additional moving parts are required.

ASCO Switches are specified by many well-known consulting engineers, utility companies, and municipal, state and federal agencies based on many years of proven field experience. ASCO Transfer Switches with built-in time delay are now demanded for more and more installations serving indispensable loads.

Write for Catalog 57-S1 and for Publication 596 describing how to select Automatic Transfer Switches.

Automatic Switch Co.

50-CC Hanover Road, Florham Park, New Jersey, FRontier 7-4600

AUTOMATIC TRANSFER SWITCHES • SOLENOID VALVES • ELECTROMAGNETIC CONTROL

ASCO®

Acme ...YOUR BEST BUY IN COMPLETE AIR CONDITIONING AND REFRIGERATION SYSTEMS

Look to Acme for the best in all types of air conditioning systems. Acme supplies a complete line of air conditioning and process cooling equipment including packaged liquid chillers, and remote room conditioners, air handlers and multi-zone units for use in direct expansion or chilled water systems. Acme water saving equipment includes evaporative condensers, indoor-outdoor cooling towers and outdoor cooling towers. In addition, Acme offers a complete range of self-contained air conditioners.

Acme components for built-up systems have long been recognized as the best available. All major manufacturers of refrigeration equipment have used Acme components for many years.

Call your Acme sales engineer for details on how he can help you with your air conditioning or process cooling problems.

Acme INDUSTRIES, INC.

JACKSON, MICHIGAN

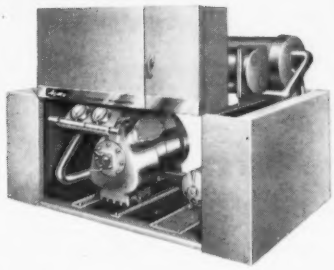
MANUFACTURERS OF QUALITY AIR CONDITIONING AND REFRIGERATION EQUIPMENT SINCE 1919

FOR THE BEST IN BUILT-UP SYSTEMS . . . USE THESE Acme MATCHED COMPONENTS

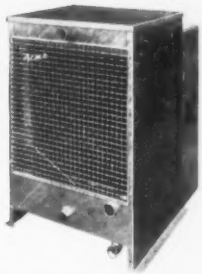
- **Direct Expansion Coolers 1 to 300 tons**
- **Shell and Tube Condensers 1½ to 700 tons**
- **Shell and Coil Condensers ¾ to 10 tons**
- **Heat Exchangers 3 to 150 tons**
- **Liquid Receivers 3 to 150 tons**
- **Oil Separators 5 to 100 horsepower**
- **Air Cooled Condensers 3 to 100 tons**
- **Direct Expansion, Water and Steam Coils**

A complete range of sizes and capacities for almost every OEM, built-up system and replacement need.

CHILLED WATER SYSTEMS

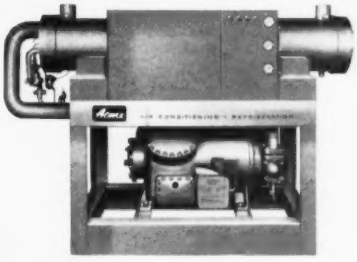


Flow Cold packaged water chillers—3 through 30 tons

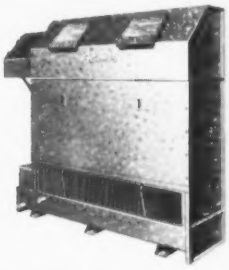


Flow Cold cooling towers—3 through 20 tons

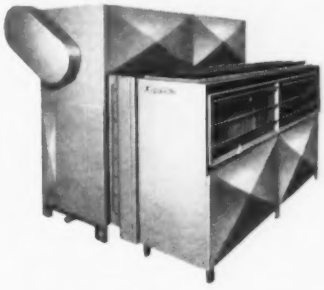
Remote room conditioners—4 types in 16 models from 200-600 cfm



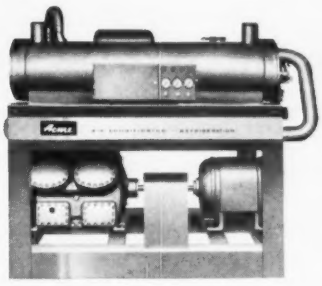
Model HE Flow Therm packaged water chillers—20 through 60 tons



Flow Mizer cooling towers—20 through 175 tons

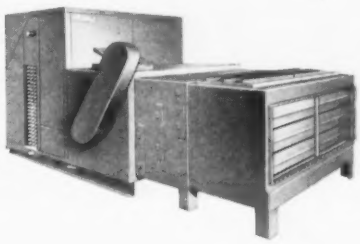


Air handlers—4 types in 40 models from 665 to 19,200 cfm



Model DE Flow Therm packaged water chillers—20 through 125 tons

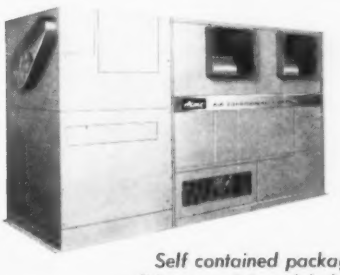
Flow Mizer evaporative condensers—Capacities to 200 tons



Multi-zone air conditioners—5 models from 4,060 to 19,200 cfm

SELF CONTAINED SYSTEMS

Self contained packaged air conditioners—5 models from 3 to 15 tons, air or water cooled



Self contained packaged air conditioners—24 models from 20 to 60 tons, air or water cooled

Atoms in Action

JOHN F. LEE
Broughton Professor and Head
Department of Mechanical Engineering
North Carolina State College

Radioactive Waste Disposal

As RITCHIE CALDER has said so well, "Burying live atoms is as expensive as burying dead pharaohs." It is not only as expensive but far more difficult because the corpse is not dead but remains as a threat to the safety of man. At one time it appeared that encasing radioactive wastes in concrete and burying them in the vast valleys of the oceans was a simple solution to the problem of disposal. Now it appears that this was a glib assumption requiring thorough re-examination. The World Health Organization is taking a hard look at the problem.

Burial Grounds

In the past 14 years, the United States has accumulated 60-million gallons of radioactive elements, which have been stored in land burial grounds at a cost of $65-million. Some of these radioactive elements will be dangerous for decades, others for centuries and, in the case of plutonium, for at least 24,000 years. Based on projected uses of atomic power, in 42 years the waste produced will require 100,000 acres annually as burial grounds, provided the most effective and most expensive methods are used. Whether disposal takes place on land or at sea, radioactivity knows no frontiers. Hence, there is cause for international concern and motivation for international cooperation.

The economic aspect of radioactive waste disposal must be taken into account even though safety must be the governing consideration. From the standpoint of economy, it would appear that sea burial is a more effective solution for certain wastes such as contaminated machinery. Also, as the space requirements for land burial increase, it is evident that the pressure for burial at sea will increase correspondingly.

Dr. E. M. Kreps, of the Soviet Union, has given a detailed report of an oceanographic study of the Tonga Trench, which extends for nearly 700 miles from the Samoan Islands to the Kermadec Islands. His study showed that even at the greatest depth a change of water takes place every five years as opposed to prior assumptions of 300 years. The study also showed that the water at every depth was actively mixing both horizontally and vertically. Therefore, there is a real possibility of radioactive materials breaking loose and escaping upward into regions where marine life is abundant. Infected marine life would form a biological chain reaction by which radioactivity would appear in foods for human consumption.

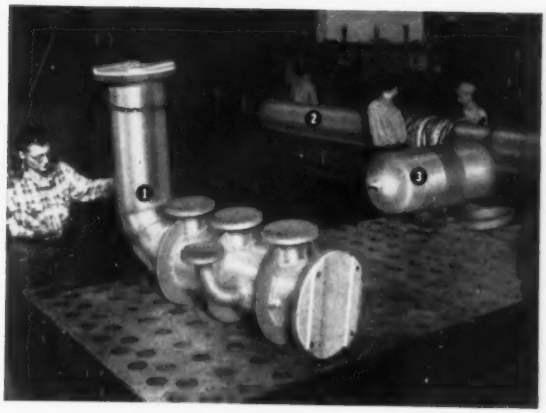
Some Organisms Concentrate Radioactivity

Kreps' study is fortified by Dr. B. H. Ketchum, of the United States. Studies conducted by the Woods Hole Oceanographic Institute showed that there is a biological elevator in the sea which brings radioactive substances from the depths to the surface. For example, this study showed that sea organisms concentrated fission products from the Bikini test area to such an extent that plankton had a radioactivity 470 times as great as that of the water in which it was found. Thus far there is no cause for alarm, but there is cause for concern about the need for international cooperation and standards for radioactive waste disposal – particularly as the waste disposal rate increases.

The Atom as a Servant of Health

Turning now to beneficial effects of the atom, there is here again the same evidence of international cooperation. The search for the fountain of youth

ALL IN A DAY'S WORK at *Pittsburgh Piping*



These three jobs are typical of the wide variety of custom piping work which we do for the power and process industries. In the background of the photo welders are shown making the heli-arc root pass on 18" O.D., 3.875" wall, chrome-moly main steam piping. In the foreground, ready for final inspection, is a 12" header for a process operation, fabricated of ⅜" aluminum alloy. The pressure vessel, of austenitic steel, is one of many we produce for atomic energy application. The manufacturing of this type of piping requires specialized facilities . . . for engineering, fabricating, testing, assembly, and erection. We have those facilities. Use them on your piping jobs.

Promoting Progress ***IN POWER AND PROCESS PIPING***

Pittsburgh Piping **AND EQUIPMENT COMPANY**
158 49th Street—Pittsburgh, Pa.

Canada: **CANADIAN PITTSBURGH PIPING, LTD.,** 68 YONGE STREET-TORONTO, ONTARIO

Atlanta .....Whitehead Building
Chicago .....Peoples Gas Building
Cleveland .....Public Square Building
New Orleans .....P. O. Box 74
New York .....Woolworth Building

new
SUPER/AIR-VAN®
in
FIBERGLAS*

U. S. Pats. 2188741, 2526290
Pats. Pending

- INHERENTLY QUIET
- SONOSOLVE HOOD
- NEVER NEEDS PAINTING
- CORROSION RESISTANT
- LIGHTWEIGHT
- STRONGER THAN STEEL
- LOW INITIAL COST
- LOW SILHOUETTE
- PATENTED SCROLL DESIGN
- PATENTED AIR SEAL OFF
- CAPACITIES 100-11000 CFM S.P. TO 4"

CERTIFIED RATINGS
AUTHORIZED BY AMCA

GALLAHER
The Gallaher Company
4108 Dodge Street Omaha, Nebraska
More than 100,000 Gallaher Air-Vans Have Been Installed.

*TM Owens-Corning Fiberglas Corporation

ignores national boundaries, and the discoveries in this search are not often subjected to secrecy.

Radioactive hydrogen, as tritium, was first introduced to mankind as a component of the hydrogen bomb. Tritium is man-made, but recently it has been learned that nature manufactures it through the bombardment of elements in the upper atmosphere by cosmic rays. Yet tritium is one of the most powerful and useful aids in the understanding of life processes. For example, tritium has permitted the tracing of routes followed by insulin in the human body. In this study, the insulin was recrystallized to include radioactive tritium and was found to retain full biological potency. When the tagged insulin was injected into the bloodstream it could be traced to the liver, the pituitary gland at the base of the brain, and to the adrenal glands. This route showed unmistakably that all three of these glands play an important part in the body chemistry involving sugars and starches.

Studies of Life Itself

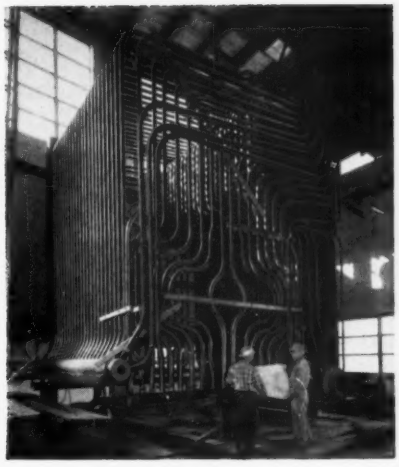
Tritium and radioactive carbon, as Carbon-14, have opened the doors to basic studies of the cell and hence to life itself. When tritium is incorporated into thymidine, it is possible to study the synthesis of desoxyribonucleic acid, known simply as DNA. This acid holds the secret of life because it is a chemical that reproduces itself. Labeled DNA makes it possible to study chromosome duplication within a single cell or the actual mechanism of cell reproduction.

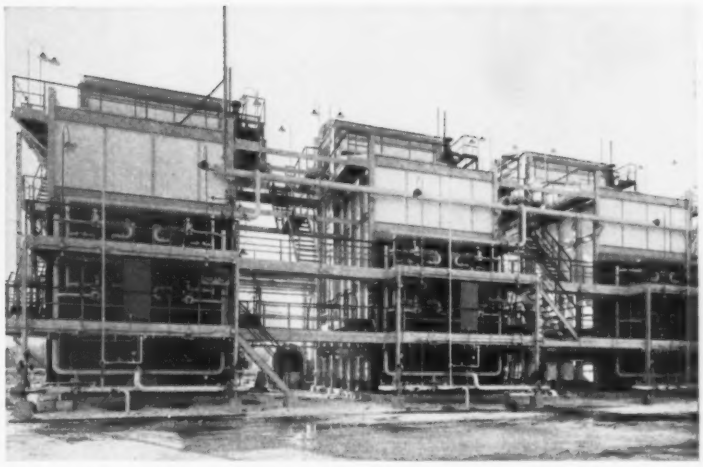
Carbon-14 also is a useful tool in studies of the metabolic processes. For example, it can show in the living processes how sugars, starches, fats, and proteins are built up and how they feed, build, or replace living tissues.

Photosynthesis

A dramatic use of Carbon-14 is its role in an explanation of the processes of photosynthesis. It is entirely possible that a knowledge of these processes made possible by Carbon-14 could, some day, permit the manufacture of food from the elements, thus eliminating dependence on the soil. By growing plants in an atmosphere containing Carbon-14, the whole pattern of these chemical factories is opened to man's observation.

Since every natural element has its isotope, there are virtually unlimited means for tracing the history of biological processes. For example, radioactive phosphorus is used to label red blood cells and has thus established a life span of 110 to 130 days for these cells. This knowledge has had a profound effect on the processes for preservation of blood for use in transfusions. Many other isotopes permit studies of biological systems in vivo





AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

CUSTOM *Steam* GENERATORS

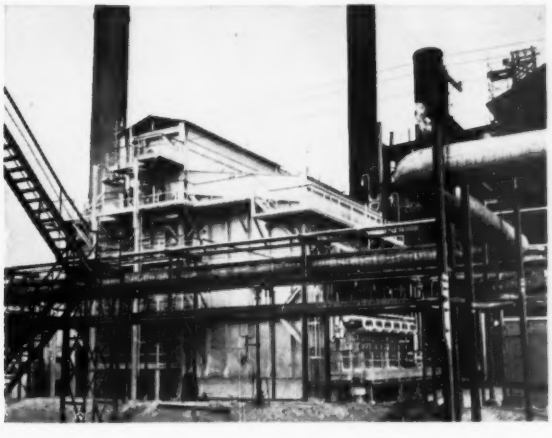
Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-BCE.

by Vogt

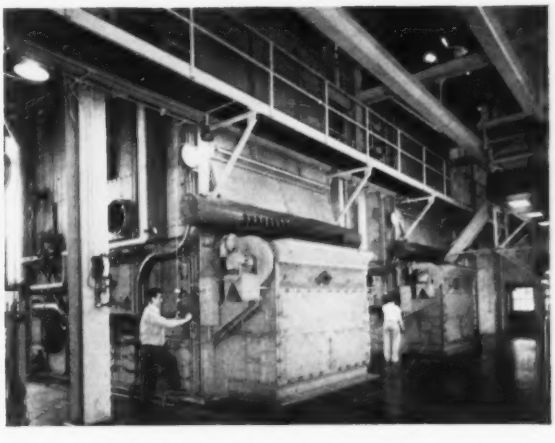
HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati

Vogt KNOW BETTER BOILERS



This 400,000 lbs/hr unit is installed in a leading petroleum refinery



Three 40,000 lbs/hr units serve a medical center

• • • Wherever workmen must go, there is a Bilco door to provide easy access. Choose from a wide range of standard units . . . or select special doors shaped and sized to your precise needs.

Ease of installation, permanent weather-sealing, and rugged construction are all part of the Bilco quality tradition. Exclusive design features include built-in spring operators for effortless lifting of even heavy plate doors. Bilco all-metal doors give you freedom of design, too—they fit and blend with any structure.

Specify Bilco doors...design with Bilco doors in mind...with confidence in Bilco lifetime quality.

See our catalog in Sweet's Architectural & Engineering Files or send for it.

Bilco®

HORIZONTAL SPRING-OPERATED DOORS

The Bilco Co., New Haven Conn., Dept. T83

Please send me your new catalog on special service doors.

NAME

FIRM

STREET

CITY ZONE STATE

where heretofore the conjecture of the post mortem alone had to suffice.

Some isotopes show the way to formulate techniques for the treatment of diseases. Studies of radioisotopes in brain systems and radioiodine in the thyroid gland have pointed the way to effective treatment of Parkinson's disease and goiter. An interesting radioisotope technique recently has been devised to diagnose heart defects. By measurement of the activity of blood samples taken from heart cavities, following inhalation of radioactive krypton, the exact location and approximate size of any existing defects may be determined. In the words of C. H. Chamberlain of the University of Pennsylvania, "Practically all the organs and parts of the body are now accessible to study."

Fear of the Peaceful Atom

Ritchie Calder has said, "Unseen, unheard, untasted, unsmelled, and unfelt – the peculiar nature of atomic irradiation worries and alarms ordinary people, who fear their own ignorance. But ignorance is relative and the doctors and biologists, who know what they do not know, can only repeat the caution of their colleague of a century ago, Claude Bernard, when he said, 'True science teaches us to doubt and in ignorance to refrain.' "

In accepting the benefits of the peaceful atom we must be prepared to accept some of the risks. This philosophy is adopted when we drive automobiles, fly in airplanes, and even when we smoke cigarettes. Yet the peculiar characteristics of atomic radiation, described by Ritchie Calder, and its awesome introduction to mankind make the philosophy of risk adopted in other phases of our lives difficult to adopt in this instance.

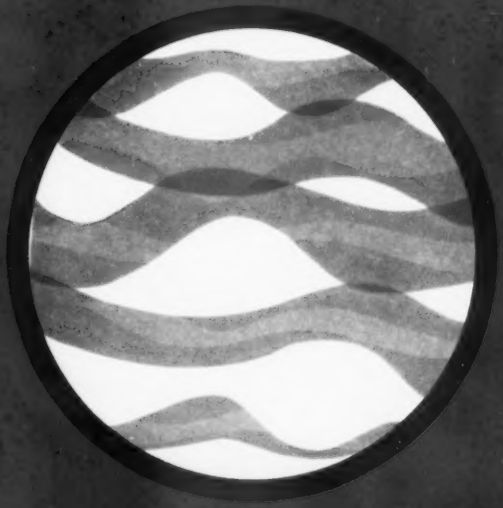
The Threat of Radiation

Much has been said about the threat of radiation to mankind. It cannot be denied that a threat exists even in many peaceful uses of atomic energy – in the nuclear power plant, in the radiation treatment of some diseases, in X-ray examinations of parts of the human body, and as an occupational hazard for personnel in the nuclear industries.

The effects of radiation on genetic or hereditary changes, life span, the nervous system, and the bone structure has many disquieting manifestations. Yet much has been learned that will limit or nullify these effects. Scientists in all parts of the world, irrespective of their political philosophies, have united in a sincere effort to push back the boundaries of ignorance in this vital area of knowledge. The cooperation and free communication in this quest for freedom from fear is one of the most impressive examples of international cooperation the world has ever seen. ▲▲

OBSTRUCTIONLESS FLOWMETERING

from a trickle...
to a torrent



FP

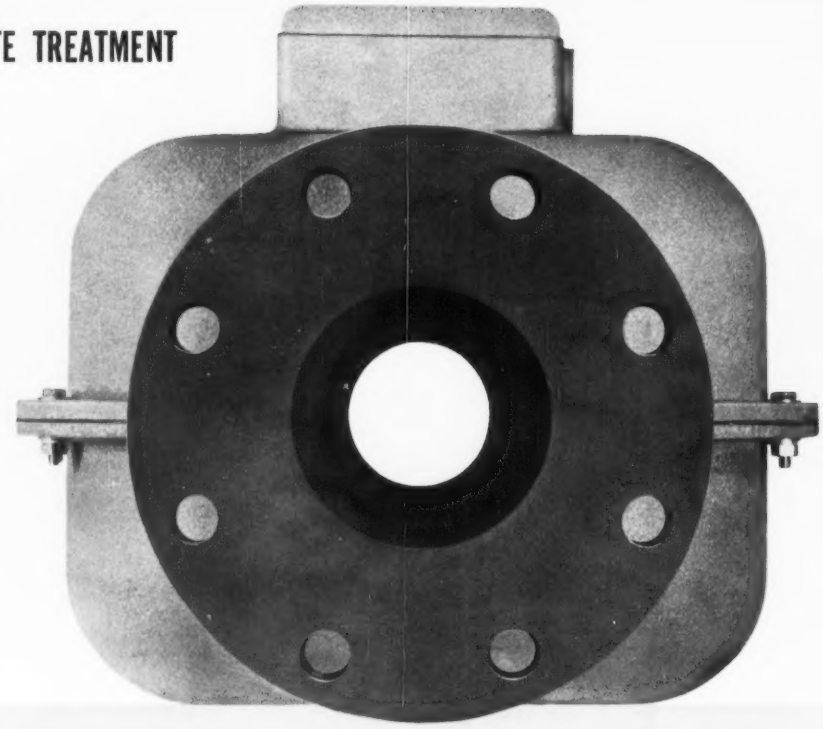
Copyright 1958 Fischer & Porter Company

F&P MAGNETIC FLOWMETER

lets you set any flow at full scale . . . from 1 to 30 fps

PROVED IN WATER-WASTE TREATMENT

In service now. No obstructions, no pressure drop, no problems. Meters raw sewage, sludges, effluent. Wide range, high accuracy for billing service.



A turn of a dial gives you full-scale recording for *any* flow rate from 1 to 30 feet per second and permits operation at optimum chart position. This flow range flexibility costs you no more . . . it's an "extra" that's built into every *Fischer & Porter* Magnetic Flowmeter.

If you want to check our claim that F & P gives you more meter for the money, take a good look at these additional exclusives:

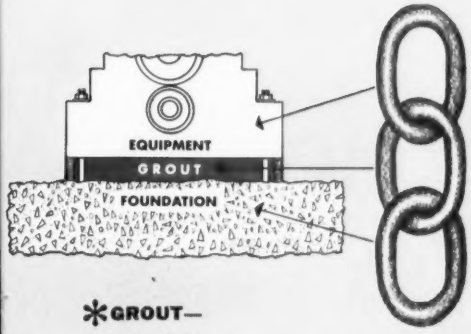
- *Any* primary is interchangeable with *any* secondary . . . no custom matching of meter to recorder.
- Remote recording up to 2000 feet from the meter.
- Power requirements substantially reduced . . . 117v, 60 cycle a-c in *all* sizes.
- Can measure reverse flows *without auxiliary equipment.*
- Fast response time . . . 2-3 seconds full scale.
- Adjustable damping of flow signal.

Before you buy *any* magnetic flowmeter, investigate the advantages of F & P's magnetic flowmeter. Get in touch with the F & P field engineer nearest you and write for Catalog 10D1416. Fischer & Porter Company, **239** County Line Road, Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Toronto, Ontario

FP FISCHER & PORTER COMPANY *COMPLETE PROCESS INSTRUMENTATION*

Copyright 1958 Fisher & Ferlay Company

. . . to withstand: **IMPACT • POUNDING ACTION • VIBRATION • SIDE THRUST • TORQUE**



***GROUT**—
the vital link
between equipment
and foundation

LEFT PHOTO. . . *Plain Grout* shrinks and leaves only a web of mortar and a small shim area to support bedplate . . . results in a *short-life* grout which causes costly shutdowns, possible equipment damage, and loss of production.

RIGHT PHOTO—*Embeco Non-Shrink Grout*. . . provides full bedplate support, maintains alignment and has high impact resistance . . . is a long-life grout that avoids trouble and cost of untimely re-grouting.

Full information on Embeco Pre-Mixed Grout and "Grouting Specifications"—a valuable guide on machinery and equipment grouting—on request.

THE MASTER BUILDERS CO.
DIVISION OF AMERICAN-MARIETTA CO.

General Offices: Cleveland 3, Ohio • Toronto 9, Ontario • *Export:* New York 17, N. Y.
Branch Offices In All Principal Cities • *Cable: Mastmethod, N. Y.*

PRE-ASSEMBLED DOUBLE CIRCUIT INTEGRATED SUBSTATION

THE FIRST INTEGRATED SUBSTATION is operating at Thorntown, Indiana . . . developed by the Public Service Company of Indiana, Inc. and Moloney Electric Company . . . designed and built to provide an efficient, economical means of serving outlying areas.

This type of unit has several distinct advantages over conventional methods of substation construction . . .

- Considerably less time is required for erection thereby effecting a saving in field assembly costs and assuring an early in-service date.
- Less handling and storage of materials.
- Engineering and purchasing time are minimized.
- Standard mounting arrangement of the low voltage structure permits replacement of the transformer with a larger unit in the event of future load growth.
- Portability.

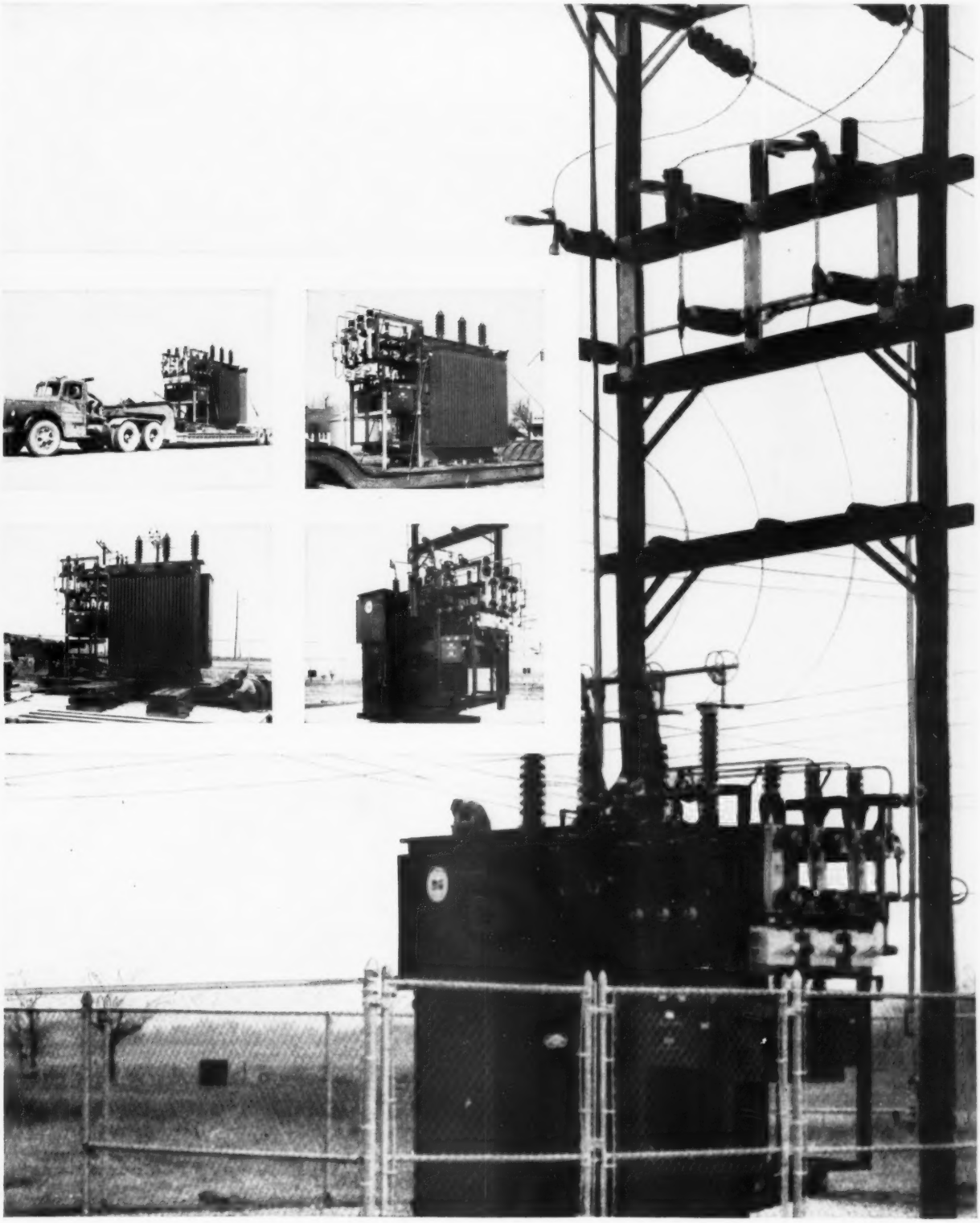
Contact your local Moloney representative for additional information on the Integrated Substation.

MOLONEY ELECTRIC

M O L O N E Y

Manufacturers of

SALES OFFICES IN ALL PRINCIPAL CITIES



E L E C T R I C C O M P A N Y

Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

News for the Consultant

Electrical Power Transmission in Europe

A recent issue of the *Elektrotechnische Zeitschrift*, the periodical of the society of German electrical engineers (VDE), carried an informative report by Dr.-Ing. Herman Roser on high voltage power transmission in Western Europe and Russia. Engineer Roser is an official of the Rheinisch-Westfaelisches Elektrizitaetswerk AG in Essen.

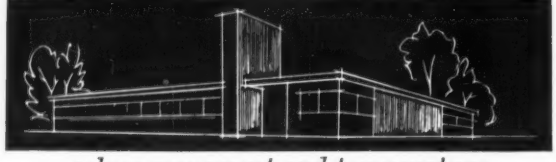
Dr. Roser describes the trend over the past 25 years toward higher transmission voltages and energies with the coincident achievements of higher load capacity and lighter weight poles, transformers, and switches. He discusses the economics and the need for higher voltages, particularly for the increasing transmission distances of the future. He notes that while the rule of thumb stating that the voltage should increase as the distance is meaningful, the rule also can mislead if it is taken to mean that high voltages are not economical for short distances.

Using graphs, Roser shows that if transmission voltages of 500 or 600 kv are used, erection costs of the transmission system are less, over both long and short distances. He shows that a 10 to 20-mile long 380-kv system is cheaper than either 220 or 110-kv systems. Drawing upon experience gathered in Sweden with high voltage transmission, the author predicts that savings of 3 to 4 percent in installation costs would result if a 380-kv system is converted to 650 kv. Using the latest reports from Russia, where transmission distances are generally very great, a prediction of savings of 15 to 30 percent in installation costs is indicated if transmission voltage is raised from 400 to 500 kv.

In view of the unsolved problems created by corona effect and the need for stability, Roser sees upper limits for alternating current transmission in light of present knowledge. The current limit on distance is about 450 miles; on voltage about 600 kv; and on load about 1.5-million kw for single and 3.5-million kw for a double line. Roser points out that it is unlikely that there will be a need to exceed these limitation in Western Europe within the foreseeable future.

On the other hand, conditions in non-European lands, for example in Russian and China, may require transmission voltages exceeding these practical limits. The solution may be a switch to direct current transmission. Not only will d-c be used for long distance transmission, but it already is finding application in underwater cable transmis-

NEW HORNFLEX SEALANT



solves movement and temperature problems in curtain wall joints

Movement due to winds and temperature extremes pose a trying problem for designers of curtain wall buildings. The joint material must seal out water, dust and air but must remain flexible and resilient under these conditions. Hornflex, a thiokol formulation, provides a squeeze-stretch range of 325% and stays firm and elastic over a temperature range from *50° F BELOW ZERO to 250° F.*

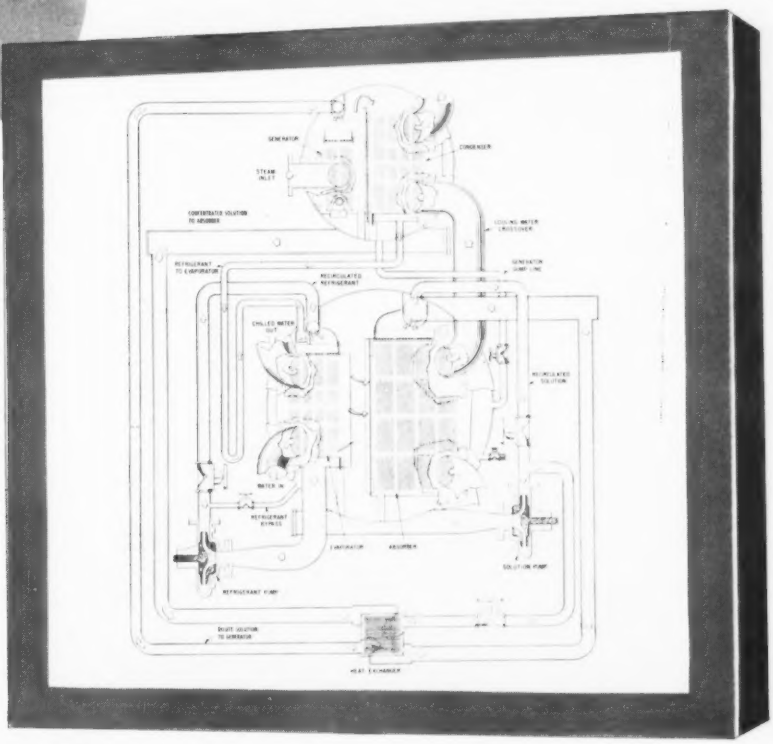
Other uses for Hornflex are to fill and seal surface joints in bridges, highways, swimming pools, etc. Laboratory test and job applications indicate that Hornflex, properly installed, will provide excellent protection for periods up to *25 years and more.*

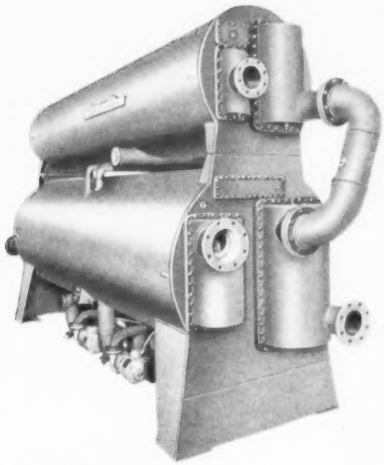
Like complete details? Write for Hornflex Technical Bulletin to Dept. H51-1229.

A. C. Horn Companies
SUBSIDIARIES & DIVISIONS
Sun Chemical Corporation
750 Third Avenue, New York 17, N. Y.

Plants: Long Island City, Chicago, Houston, Los Angeles, San Francisco, Portland, Ore., Toronto
Sales Offices and Warehouses throughout the United States and Canada

Look Inside YORK'S 23-YEAR ABSORPTION EXPERIENCE FOR THE ANSWER TO MORE ADVANCED LITHIUM-BROMIDE SYSTEMS





Turns Steam or Hot Water Into Chilled Water for Air Conditioning

From York's background of 23 years' experience in absorption refrigeration comes the latest in automatic, heat-operated water cooling systems. Low-pressure steam or high-temperature water is the activating medium. No motor drive, no expensive starters or heavy electrical conduit needed. Water is the refrigerant... lithium bromide the absorbent. Chills water and other fluids for air conditioning and process refrigeration in capacities from 100 to 740 tons.

Exclusive with YORK

- Advanced-design generator results in quiet operation, rapid start-up and close control.
- Low pump horsepowers add up to significant operating economies.
- Steam valve provides simple, direct capacity control.

YORK

YORK CORP. SUBSIDIARY OF BORG-WARNER CORP.

BORG-WARNER
RESEARCH & ENGINEERING
MAKE IT BETTER

Air Conditioning, Heating, Refrigeration and Ice Equipment • Products for Home, Commercial and Industrial Installations

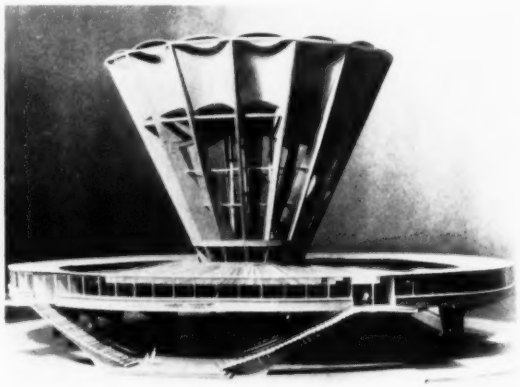
sion. A 60-mile sea cable (100 kv) presently links Sweden and Gotland; a 200-kv line under the Channel soon will connect England and France. Direct current is one answer to problems of stability and the corona effect which complicate a-c transmission.

A study of existing, planned, and possible high voltage transmission projects shows that Western Europe and England within several decades will have well-developed grid systems. Yugoslavia may be bound to Italy by undersea cable to link Western Europe with the Balkan peninsula. Not only will England be tied to the French grid, but it is the first nation to integrate closely its plans for nuclear power stations with the rapidly expanding grid system. Most of the system linking the European nations will be 380-kv a-c, with d-c used for undersea cable transmission.

Projects under construction and planned in Russia are most interesting. Already in operation in European Russia is a 400-500 kv line from Kuybyshev to Moscow while a nearly 600-mile line, also transmitting at 500-500 kv, from Stalingrad to Moscow is planned for 1959. By 1960, about 3000 miles of 400-500 kv a-c and nearly 300 miles of 400-kv d-c transmission will be in operation. In addition to these extensive projects for European Russia, the government plans to use the enormous water power resources and coal deposits of Siberia with energy transmission from 600 to 1200 miles at 600-kv d-c (1200 kv and 5-million kw for double lines). These projects may reach fruition before 1970. Eventually, European and Asiatic Russia may be bound by a grid using 1200-kv d-c for long distances with 600-kv a-c for distribution.

Canadian Observatory

A 37-ft high, 36-ft diameter rotary dome housing a 48-in. reflector telescope was completed recently for the Dominion Astrophysical Observatory on Little Saanich Mountain on Vancouver Island, British Columbia. A. B. Sanderson & Co., Ltd.,



Model of new observatory on Vancouver Island, B.C.

Vancouver, project consulting engineers, designed the dome supports as 12-in. diameter steel wheels mounted on spring trucks. The telescope is capable of photographing objects 100 million light years from the earth.

Private Practice in Sweden

The Swedish Association of Consulting Engineers reports that Swedish consultants still have no errors and omissions insurance. As yet none of the members of the Swedish Association have been involved in any serious negligence claims and because of this have rejected proposals for such coverage. They also feel that the client's knowledge of the existence of such insurance might encourage him to raise minor claims which he would otherwise be inclined to overlook. However, such factors as an increased number of junior engineers on the staffs of consulting firms, a heavier work load by senior engineers, the introduction of more intricate calculation methods, a trend toward producing designs featuring extremely economical use of materials, and higher capital costs for construction work indicate that Swedish consultants soon

Aget offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

AGET MANUFACTURING COMPANY
1378E. CHURCH STREET • ADRIAN, MICHIGAN

In missiles and millinery shops, movies and map centers . . .

Rising slowly on a column of flame, a giant guided missile lifts from its launching pad. Air-conditioning plays an important part in the manufacture and assembly of missiles by protecting intricate parts against temperature and humidity variations.

You'll find

genetron®

SUPER-DRY REFRIGERANTS

Filling the Air-Conditioning and Refrigeration Needs of Modern America

In thousands of different air-conditioning and refrigeration applications, you can count on "Genetrons" for top performance. These refrigerants are universally accepted for use as original or replacement charge. Leading manufacturers, refrigeration engineers and air-conditioning and refrigeration wholesalers approve, specify and recommend them. They offer unexcelled quality and dryness . . . and their strict specifications are consistently *bettered* in production.

"Genetron" Super-Dry Refrigerants are available from wholesalers everywhere, coast to coast. See your wholesaler. Ask for "Genetron"!

genetron 11 ORANGE LABEL CCl_3F TRICHLOROMONOFLUOROMETHANE

genetron 12 WHITE LABEL CCl_2F_2 DICHLORODIFLUOROMETHANE

genetron 22 GREEN LABEL $CHClF_2$ MONOCHLORODIFLUOROMETHANE

genetron 113 PURPLE LABEL $C_2Cl_3F_3$ TRICHLOROTRIFLUOROETHANE

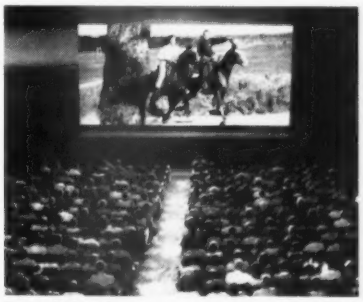
genetron 114a BLUE LABEL $C_2Cl_2F_4$ DICHLOROTETRAFLUOROETHANE

Allied Chemical

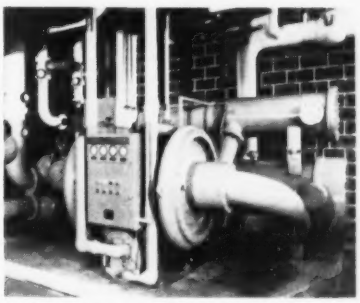
GENERAL CHEMICAL DIVISION

40 Rector Street, New York 6, N. Y.

No fuss—but plenty of feathers as milady tries on one hat after another in her air-conditioned millinery shop.



Part of the show in our modern American movie theatres is comfortable air-conditioning. Movie managers have learned that the "air-conditioned" sign on a theatre marquee is good for business.



At the Army's map service center, Kansas City, Missouri, this 100-ton refrigeration unit helps control temperature and humidity. The paper, plastic and film used in map-making require precise temperature and humidity control. *The Trane Company Photo*

may find it necessary to carry liability insurance.

There is also a growing trend in Sweden for architects working on the borderline between architecture and engineering, such as in community planning, housing development, and traffic engineering, to associate with consulting engineering firms specializing in such fields as domestic water supply and sewage treatment. These mutually beneficial new ventures point to an over-all bettering of relations between architects and engineers.

Brookhaven Medical Research Reactor

The world's first nuclear reactor designed specifically for medical use has gone into operation at Brookhaven National Laboratory, Upton, New York. Part of the new $6.5-million Medical Research Center, which includes a 48-bed research hospital and laboratories totaling 110,000 square feet, the reactor permits specialized treatment and studies of humans and animals not possible until now.

Two ports on opposite sides of the heavy concrete walls of the reactor direct streams of neutrons from the core into separate treatment rooms — one for humans and one for experimental animals. These ports can be closed in three seconds by means of 21-ton shutters. A third face of the reactor is equipped for irradiation of large objects; and the fourth has tubes leading into the core for irradiation of small samples and the making of short-lived radioisotopes.

The enriched uranium reactor is water cooled and moderated and has an operating power level of 1000 kilowatts.

Architect-engineers on the project were Eggers & Higgins, mechanical engineers were Syska & Hennessy, and structural engineers were Weiskopf & Pickworth. All firms are located in New York City.

New Thousand Islands Bridge

A second span is being added to the International Rift Bridge, one of the five bridges of the Thousand Island International Bridge crossing the St. Lawrence River. D. B. Steinman, New York consulting engineer, has designed the new 90-ft reinforced concrete structure and a reinforced concrete pump and transformer house on one shore between the two bridges. Completion date is scheduled for July 1959.

New bridge, foreground, will speed one-way traffic between the American and Canadian customs offices.

Airport for Dominican Republic

A new jet-age airport, with an 8400-ft long, 200-ft wide runway, is under construction in Cuidad Trujillo, capital city of the Dominican Republic. The concrete runway pavement has been designed to support the landing impacts of aircraft, with dual tandem landing gear, weighing over 400,000 pounds. Plans call for future extension of the runway to 12,000 feet and addition when traffic requires of a second even longer parallel runway.

The reinforced concrete terminal and its ten-story control tower will be air conditioned.

Rader and Associates, Miami, Florida and William S. Gardner, Jr., Cuidad Trujillo, are consulting engineers on the project.

Big Dry Dock

One of the world's largest dry docks will be built for the U. S. Navy at Bremerton, Washington. Congress has authorized $25 million for construction of the first increment of the $32 million project, which will be big enough to handle repair of the

ADJUSTABLE . . . ACCENT LIGHTING

NEO-RAY ROTO-STRIP

U. L. & C. S. A. Approved U. S. Pat. No. 2,790,894; Pat. in Can.

. . for Stage lighting

. . . for Display Lighting

Stock sizes of 2'—3'—5'—8' Lengths. Can be used for continuous runs.

For surface, corner or recessed mounting.

No. 13

No. 13C

No. 103

• Low in Cost

• Low in Installation

This complete, compact, adjustable, shallow unit . . . with built-in, recessed roto sockets, finger-tip adjustment . . . swings 90 degrees in all directions through a complete 360 degree circle. Stays put at any angle.

Send For Complete Catalog No. 541C

Sold Through Wholesale Distributors

MANUFACTURERS OF LIGHTING FIXTURES INCLUDING:

Louvred Ceilings • Roto-Strip • Luminette • Kleen-Vu KVT Troffers

NEO-RAY PRODUCTS, INC.

315 East 22nd St. • New York 10, N. Y.

wherever you see the name **BEATTY** you find SAFETY and EFFICIENCY

BEATTY SCAFFOLD . . . featuring Beatty patented "Snap-Lock," the greatest labor-saving device in scaffolding history. Open frame design to prevent accidents and provide easy access. Tubular cross braces for strength and low maintenance. Steel or aluminum.

For every scaffolding use, including Rolling Towers, Grandstands, Bleachers, Platforms, etc.

Also Beatty Heavy Duty Shoring Frames for reducing equipment costs and saving labor. Sales or rentals.

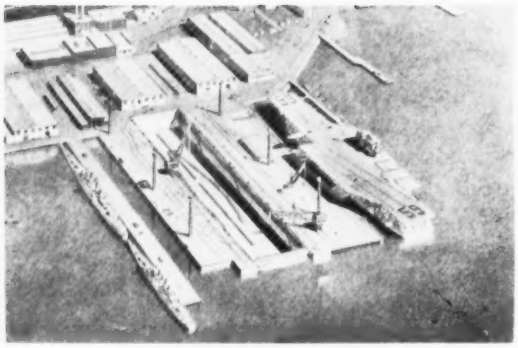
BEATTY PECCO-SPAN HORIZONTAL SHORING . . . the latest development in adjustable telescopic support for all types of concrete constructions. Saves up to 40% on shoring labor. Can be used with your present scaffold or Beatty Heavy Duty Shoring Frames.

One man adjusts to any span by wedgelock action—no bolts. Access to all working areas. Built-in camber.

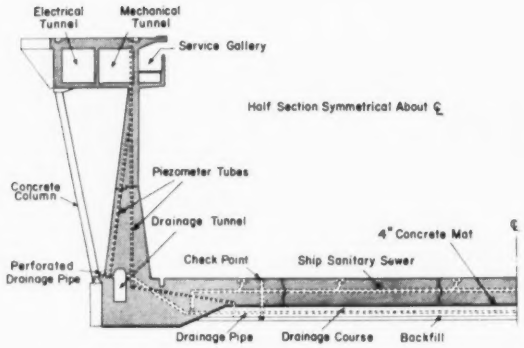
BEATTY-PECCO CONSTRUCTION CRANE . . . a new GIANT reaching from 50 to over 300 feet in the air to place materials at points of use. Electronic remote control. Automatic safety. Practical—adaptable. Highly mobile. Thousands now in use.

BEATTY SCAFFOLD, Inc. Tunnel Ave. & Beatty Rd. • San Francisco

BOISE • COVINA & SO. CALIFORNIA • EL PASO • HONOLULU • PHOENIX • PORTLAND
SACRAMENTO & CENTRAL VALLEY • SALT LAKE CITY • SAN JOSE • SEATTLE • SPOKANE



Design of the new Puget Sound dry dock calls for construction area to be enclosed with earth dams.



A precision drainage system will permit lowering of groundwater level when dry dock is dewatered.

Navy's largest – Forrestal Class – carriers. Carey and Kramer, Seattle engineers, and Moran, Proctor, Mueser and Rutledge, of New York, designed and prepared plans for the structure, to be known as Dry Dock No. 6.

The dry dock will be 1152-ft 6-in. long, 188-ft wide at the base, and 180-ft wide at the coping, with a 61-ft depth from coping to floor. The concrete floor slab is 7-ft thick throughout the central portion increasing to 12 feet under the wing walls. A 4-in. concrete mat is to be placed over the entire floor to keep out dirt and protect the drainage course and base material during construction.

Floors of the electrical and mechanical tunnels are 11½ feet below the top of the dry dock and are 8-ft 9-in. high, and 8-ft 5-in. and 8-ft 10-in. wide, respectively. Continuous service galleries along both sides of the dock average 6-ft 8-in. high by 6-ft wide. Longitudinal floor slab construction joints are placed on 40-ft centers and transverse construction joints are on 24-ft centers. Wall thickness is 12 feet at the base and 2 feet 9 inches at the top. Reinforced concrete columns used to support the electrical and mechanical tunnels are 22-in. square and are placed on 16-ft centers.

The dock is of the relieving type requiring continuous drainage. A drainage course of permeable material is placed under the dry dock floor and adjacent to the walls to permit percolation of seepage water into the drainage system. The underfloor drain system is composed of a system of perforated pipes with headers terminating in the side wall drainage tunnels. Perforated drainage tile supported on the outside of the wall will drain this area. To permit the checking of water levels and the operation of the drainage system, piezometer tubes run in the walls and floor.

The separate pumpwell structure is 139-ft long by 69-ft wide, and extends below the level of the dry dock floor. The four main dewatering pumps have 96-in. diameter impellers and are rated at 115,000 gpm at 41-ft total head. Each pump is driven by a 1500-hp electric motor. Three pumps have inlets in the dry dock floor; one pump is directly connected to a large wet well at the rear of the pumpwell. This arrangement will allow more efficient pump operation at the later stages of dewatering. Total dewatering time is 3½ hours.

Three, 15,000-gpm electric motor driven pumps are provided for seepage control. The intakes for

JUST IN CASE...

ERRORS AND OMISSIONS INSURANCE

For

Engineers • Architects

Surveyors

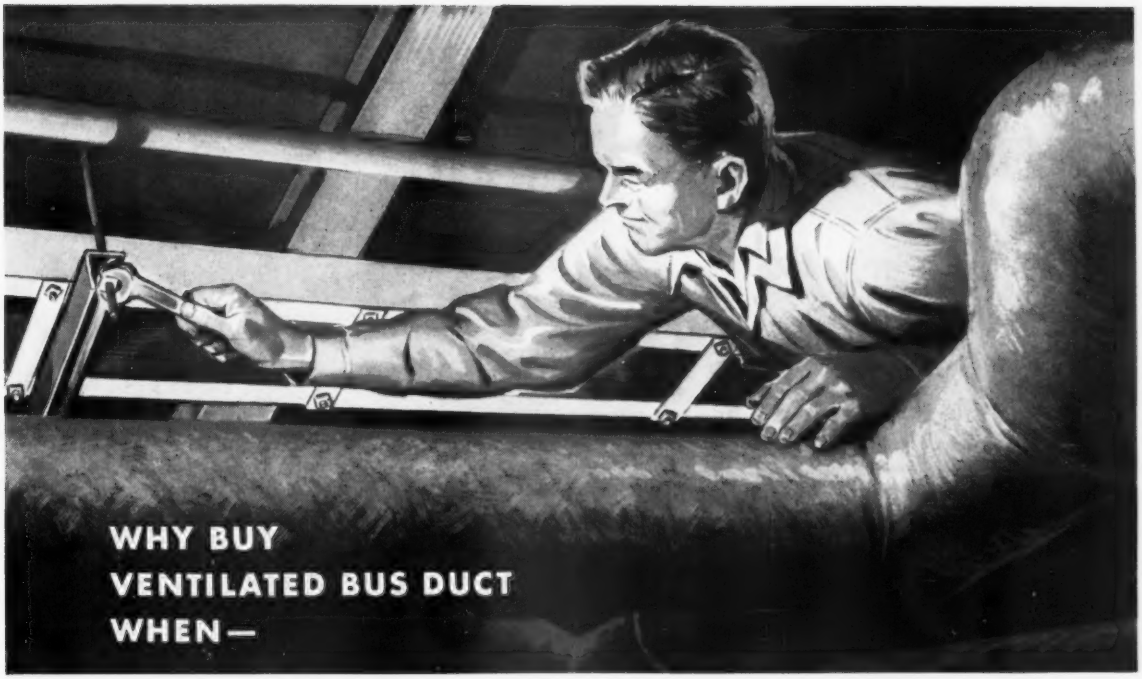
The LUDDINGTON CORPORATION

Insurance Agents and Brokers

310 Main Street

Orange, N. J.

50 Church St. New York, N. Y. • 508 Main St. Boonton, N. J. • Box 604 South Yarmouth, Mass.



Square D TOTALLY ENCLOSED Duct*

takes less space—*and costs no more*

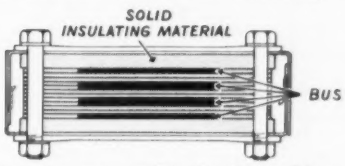
*(low impedance)

Ventilated bus duct is bulky and awkward. It's difficult—sometimes impossible—to install it in restricted areas. The layers of insulation around the bus bars and the necessary air spaces contribute to large, inconvenient size.

Square D totally enclosed feed-in duct solves the space problem. Solid sheets of insulation permit mounting bus bars only ¼" apart. This solid insulating material is also an effective heat conductor, thus eliminating the need for air spaces. The result—Square D low-impedance duct is as much as 50% smaller than ordinary duct. It can be used where no other duct fits. It makes expansion of existing electrical systems easier, new construction planning simpler. Best of all, Square D low-impedance bus duct is totally enclosed. Having no ventilation holes, it's safe from physical damage and dust accumulation. Needing no ventilation, it can be mounted in any position without de-rating.

Doesn't it make sense, when buying feed-in duct, to specify a product that will meet all your requirements? Square D totally enclosed low-impedance duct costs no more—why settle for less?

Here's Why Square D's EXCLUSIVE Design makes ventilation unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct is listed with Underwriters' Laboratories and meets U/L requirements for temperature rise in any mounting position.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

these pumps are in the wet well, which can be operated as a storage reservoir and permit intermittent operation of these drainage pumps. Two, 3500-gpm fire pumps will provide the necessary salt water for fire protection of the dry dock.

Upper American River Hydroelectric Project

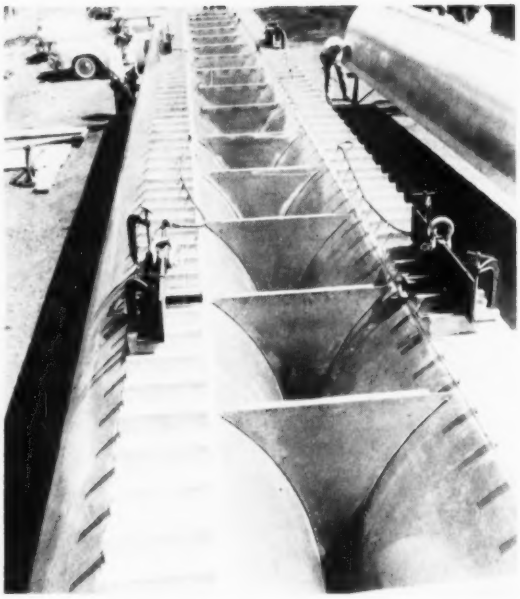
The Bechtel Corporation, San Francisco engineers and constructors, has completed a report declaring that the Sacramento Municipal Utility District's Upper American River hydroelectric project is economically feasible. The report also supported the sale of $85 million of revenue bonds to finance its construction.

The firm, to be responsible for making final designs and supervising construction, estimates that the first power will be produced in the fall of 1960.

Reynolds-Baroni Aluminum Bridge

A 60-ft long, 12-ft wide prototype of a new aluminum bridge design has successfully completed a series of severe structural tests conducted by New York University's Department of Civil Engineering. Formed of 4-ft wide parallel parabolic arches and stiffened by diaphragms, the Reynolds-Baroni Bridge permits rapid and economical erection from standard prefabricated modular units.

Tests conducted were those suggested by the Federal Bureau of Public Roads and are equivalent to 100 years of service under maximum loads. Test loadings up to 70,000 pounds, nearly double the design load, have been applied to the structure's concrete covered single lane. The bridge is designed for H20-44 loading.



Concrete roadway shear connectors and intermediate diaphragms are seen in this view of the new bridge.

Designer is Dr. Giorgio Baroni, engineer, noted for his pioneering efforts in thin-shell structures. Reynolds Metals Company built the prototype and fabricated the three, 60-ft long units.

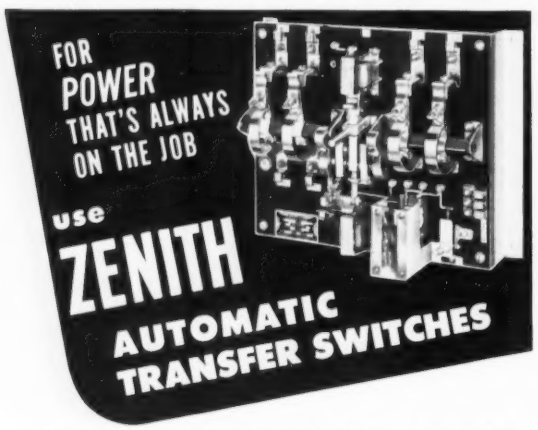
The first Reynolds-Baroni Bridge is being built in Alabama. This bridge will be 234-ft long and will cross Big Wills Creek in DeKalb County.

New Pavement Developments . . . One Tough

Shell Development Company has perfected an Epon resin-impregnated asphalt with remarkable toughness and wear-resistant characteristics. The new pavement can withstand temperatures to 600 F, is unaffected by jet fuels, gasoline, hydraulic fluids, and cleaning solvents, and will not deform under heavy loads.

Laboratory and limited field tests show the new paving material combines the flexibility of asphalt with the strength of concrete. During comparative tests, a beam of the Epon-asphalt deflected ½ inch before failing at 159 pounds pressure; an ordinary asphalt beam failed at 15 pounds pressure with a ½-in. deflection; and a Portland cement beam deflected 0.02 inch before failing at 225 pounds load.

Further field tests of the capabilities of the material are being made at San Francisco International



Zenith Automatic Transfer Switches assure full protection against *any* failure of regular voltage. Transfer to emergency power in a fraction of a second is automatic at 70% of line voltage. Regular power is restored at 90% of line voltage.

Simple design . . . sturdy construction . . . switches lock mechanically through trouble-free toggle action . . . no springs, latches or delicate mechanisms.

Available electrically or mechanically held, 30 to 600 amps.

Send for 64-page Engineering Reference Catalog E18-A.

ZENITH ELECTRIC CO.

145 WEST WALTON STREET • CHICAGO 10, ILLINOIS

MODERNIZED WITH *MODERN* CAST IRON BOILERS

The outstanding advantages of modern cast iron gas boilers dictated their use in this church property installation. Two Weil-McLain Type "J" Cast Iron Gas Boilers provide the heating for the church, rectory, school and recreation hall.

These units replaced two condemned steel stoker-fired boilers, using only about one-half the space previously required. The system now needs only periodic maintenance, relieving the previous full-time janitor for other duties.

Weil-McLain "Easy-Fit" Headers were installed on the boilers by two men in three hours, saving time otherwise required to fabricate and install a built-up header.

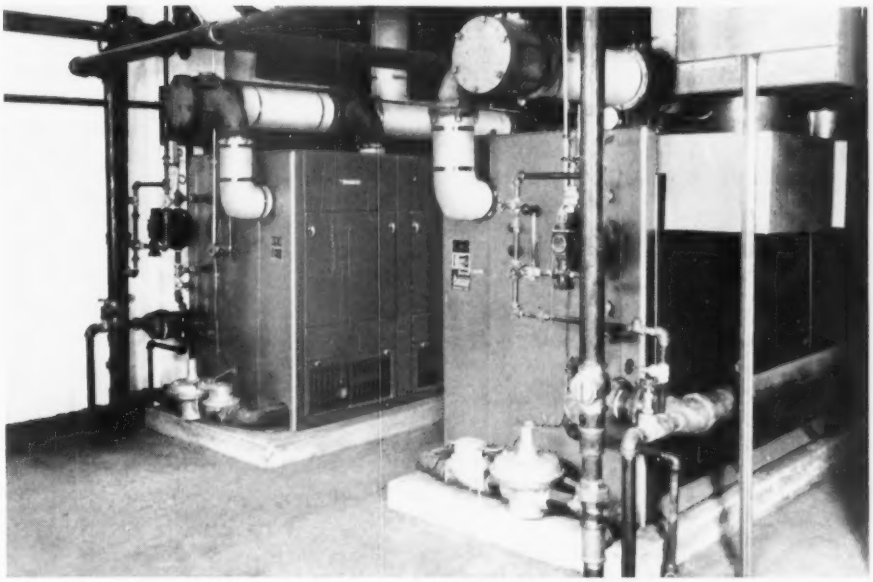
Weil-McLain Type J Boilers offer these features for efficiency, dependability and long life...

1. Made of cast iron, the lifetime metal—impervious to the corrosive effects of condensation.
2. Compact design saves space.
3. Develop full capacity as rated by I=B=R.
4. Can be equipped with latest electronic controls.
5. Can be assembled at any stage of building construction. Sections pass through ordinary door.
6. Capacity easily increased by merely adding sections.
7. Available with dual fuel manifold.
8. Complete access for easy cleaning and maintenance of top efficiency.
9. "Easy-Fit" Headers simplify erection—reduce installation cost.
10. Completely enclosed in handsome enamelled steel jacket, fully insulated.

Church of the Annunciation B.V.M. and School Building, Cincinnati, Ohio

ENGINEERS AND CONTRACTORS:
American Boiler and Radiator Co., Cincinnati, Ohio

DISTRIBUTOR:
Aramac Supply Company, Cincinnati, Ohio



Send for literature on Weil-McLain Type J Gas Boilers or see listing in Sweet's Architectural File. Capacities 625,000 to 5,000,000 A.G.A. Input BTU/hr.

WEIL-McLAIN TYPE "J"

WEIL-McLAIN BOILERS · RADIATORS

CAST IRON GAS BOILERS

Address literature requests to Weil-McLain Co., Dept. DD-39, Michigan City, Indiana

Airport where 3½ acres of conventional asphalt apron on United Air Lines' new jet maintenance base were paved with a ½-in. overlay. Shell engineers say the paving can be made in standard hot-mix asphalt plants and applied with conventional paving machinery and rollers.

. . . One Skid-Resistant

The Du Pont Company has found that the addition of neoprene as an asphalt surface treatment provides quicker stopping in automobile locked-wheel skids. A test car, in "panic stops" at 40 mph, averaged 94 feet braking distance before stopping on ordinary asphalt and stone chip pavement of the type used for maintenance on public roads. On an identical road surface that had been modified by the addition of 1½ percent neoprene, braking distance was 82 feet.

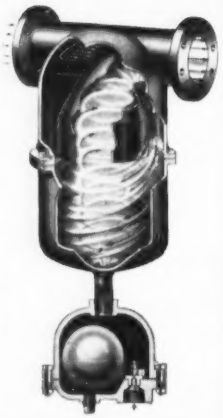
This improved stopping efficiency results from the increased coefficient of friction of the modified pavement, due to neoprene's ability to hold stone chips and decrease asphalt "bleed through" to the surface. Ordinary asphalt tends to coat the top of surface chips and reduce surface roughness. Wet pavements did not reduce the superiority of the neoprene-modified asphalt.

Testing was conducted on a road laid by the Delaware Highway Department in 1957. Both the neoprene-modified and control sections had been in service for nearly a year before the tests, with resulting exposure to all kinds of weather.

New Design Assures Maximum Entrainment Removal With Low Cost "T" Separator

Redesigned annular passage increases centrifugal force. Separated moisture, oil and solids travel outer wall to lower collecting chamber. Large diameter, high level outlet reduces velocity, eliminates entrainment problems. Screwed ends ½" thru 3". 125 lbs. flanged ends 2½" thru 8". Low cost in-line installation.

Combined with No. 90AC automatic drain trap to prevent loss of steam, air or gas provides most efficient and economical separator-drain combination available.



WRITE FOR BULLETIN TB-541-B

WRIGHT-AUSTIN COMPANY

3245 WIGHT STREET • DETROIT 7, MICH.

Panama Canal Improvements

Parsons, Brinckerhoff, Hall & Macdonald, New York consulting firm, has submitted a report to the Panama Canal Company reviewing 1947 studies for long range improvements of the canal. Cost estimates and recommended construction procedures for three alternate plans were included.

Two of the plans involve addition of larger locks and widening of the present channel. About 150-million cubic yards of rock would have to be excavated to accomplish either of these recommended improvements. The third plan reviews conversion of the Panama Canal to a sea-level waterway, entailing excavation of over 1-billion cubic yards of rock. The firm estimates this would take about 11 years to complete, removing ¼-million cubic yards of material per day.

Airport Expansion Programs

Wilsey and Ham, Engineers and Planners, Millbrae, California are making an engineering survey for the new Tahoe-Truckee Airport which will provide complete facilities for major commercial and charter aircraft serving the 1960 Winter Olympic Games. The new facilities will be constructed by a joint district organization including Placer and Nevada Counties. The survey and the design work to be done by Wilsey and Ham will be coordinated by the California Aeronautics Commission.

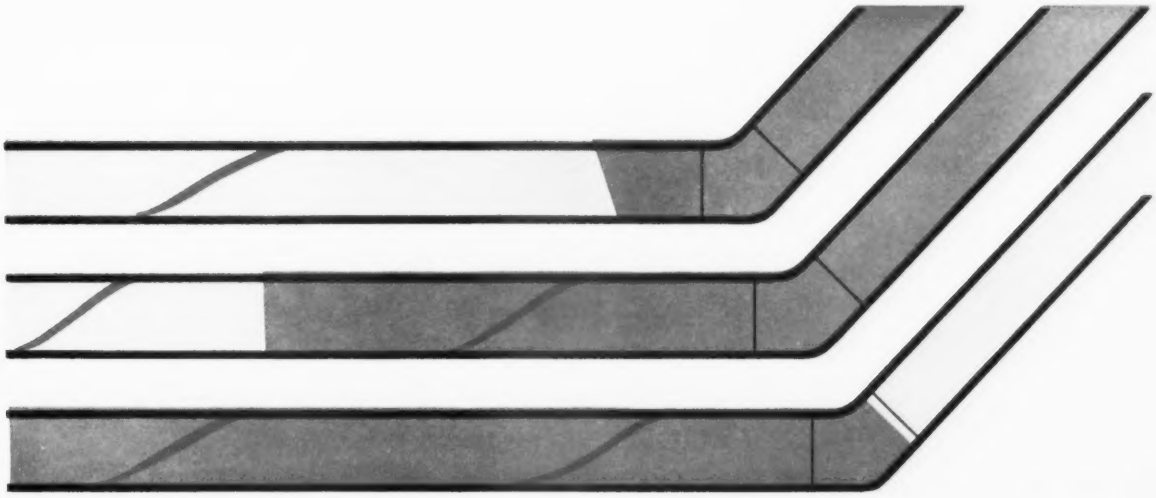
Johannessen and Girard, Phoenix, Arizona, have been retained by the city of Phoenix at an $85,000 fee for engineering and design of the Sky Harbor Airport expansion program. The firm will plan the aprons, taxiways, ramps, roads, parking lots, and an underground jet fuel tank farm. It also will supervise the $1,650,000 bond fund for the project.

Third Lake Champlain Bridge Studied

Fay, Spofford, and Thorndike, Boston engineering firm, has reported to the Lake Champlain Bridge Authority that a toll bridge from Grand Isle, Vermont to Cumberland Head, New York is not economically feasible. The proposed long-span suspension bridge, the only type considered suitable at this location because of extreme water depth and condition of the lake bottom, was estimated to cost at least $60 million. Alternative designs, such as a floating bridge, a low-level bridge composed of short spans, and a tunnel were ruled out as being even more costly.

The firm also reported that a bridge at a site less desirable from a traffic standpoint – crossing the lake at Isle LaMotte – would cost $28 million. This project would require substantial increases in

4-D WROUGHT IRON STEAM RETURN LINES



STEAM CONDENSATE CORROSION: the cause, the effect, and a suggested safeguard

4-D represents the most significant development in the history of wrought iron metallurgy. It was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content and using a more siliceous iron silicate. Result is increased corrosion resistance, improved mechanical and physical properties.

Write for new 4-D Wrought Iron literature and our special report, The Use of Wrought Iron in Steam Condensate Lines. A. M. Byers Company, Clark Building, Pittsburgh 22, Pa.

WHAT CAUSES STEAM CONDENSATE—Steam, losing its heat, turns to moisture as temperature drops below saturation level. This condensate is distilled water, greedy for gases. Any gas in the steam is readily absorbed into this condensate as it cools. The condensate becomes violently corrosive to ordinary piping materials, depending upon the percentage of free CO_2 plus O_2 in the steam.

EFFECT OF STEAM CONDENSATE ON PIPE—Carbon dioxide is the primary cause of return line corrosion. Like oxygen, carbon dioxide is present in all raw waters and may enter the boiler with the feed water. Most of the carbon dioxide found in the steam cycle results from decomposition of the bicarbonate or carbonate content of the boiler feed water. Build-up of insoluble products of corrosion—particularly in smaller lines—may plug the pipe and render it useless. Corrosion may cause grooving, channeling, pitting, completely penetrating the pipe wall.

A PIPING MATERIAL THAT COMBATS IT—New 4-D Wrought Iron is a two-component metal consisting of high purity iron and iron silicate fibers. There are over 250,000 non-rusting glasslike fibers to every cross-sectional square inch. The purity of the iron itself, plus the protection of the iron silicate fibers are a mighty formidable deterrent to corrosion.

BYERS 4-D WROUGHT IRON

tolls of the two existing Lake Champlain bridges and nearly 40 years to finance.

Big Thermal Power Plant for India

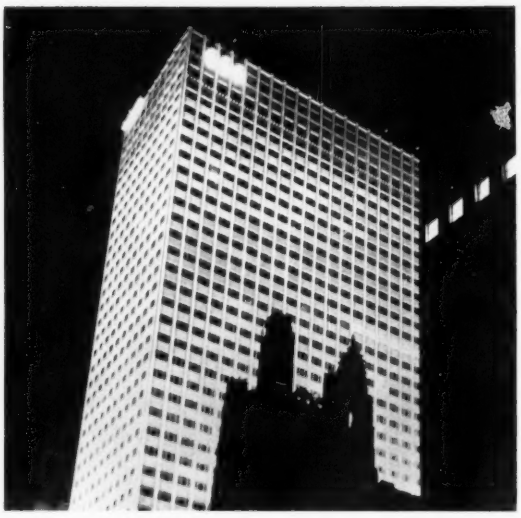
Gibbs & Hill, Inc., New York, have been selected as consulting engineers for the first 125,000-kw unit of a 750,000-kw thermal power plant at Dugda, India by the Damodar Valley Corporation, Calcutta. The plant will operate on high-ash coal middlings and rejects; throttle conditions will be 1800 psi at 1050 F, with reheat to 1000 F.

Consulting services involve site selection, preliminary design, equipment purchase, detail design, supervision of construction, and equipment start-up. Dugda Station will be the third thermal plant in a regional development program that includes a number of hydroelectric projects.

Exterior Lighting for Large Buildings

An example of the increasing application of exterior lighting for monumental buildings is New York City's Tishman building at 666 Fifth Avenue. The architects of the new 38-story skyscraper, Carson & Lundin, retained Abe H. Feder, lighting consultant, to design a lighting system that would function as an integral part of the structure.

Feder specified 1000-watt high voltage mercury vapor reflector lamps and used a total of 72 fixtures to give 9.7 million candlepower. The fixtures



Special cone-shape reflector housing 1000-watt mercury lamps provides 5 footcandles at 350 ft.

are mounted on the 10th and 15th floor setbacks and placed to provide even illumination.

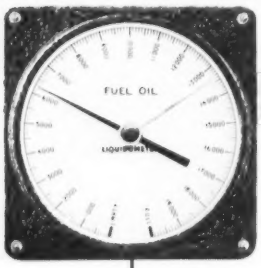
Soviet Engineers Overseas

Russia is on its way to becoming the largest exporter of engineers to underdeveloped countries, according to Dr. J. F. Calvert, head of the department of electrical engineering at the University of Pittsburgh. He estimates that the huge numbers of Russian engineers being graduated are likely to replace other foreign technical personnel "on an immense scale."

Pennsylvania Turnpike Tunnel Study

Pennsylvania Turnpike officials have directed Michael Baker, Jr., Inc., of Rochester, Pa., the highway's consulting engineer, to study the feasibility of drilling two new tunnels through the Allegheny Mountains. The proposed tubes would be cut alongside the present Laurel Hill and Allegheny Mountain tunnels, the biggest bottlenecks on the pike. Steep approaches, both from the east and west, slow down the heavy trucks, and as the road funnels down to two lanes at the tunnel entrances, traffic often slows to a crawl.

Preliminary estimates are that the new tunnels would cost $20 million. Although the Federal government has taken over the Pennsylvania Turnpike as part of the interstate system, as yet it has contributed no funds. Highway officials believe if the Baker engineering report shows that the traffic slowdown could be eliminated with the additional tunnels, the Federal government might provide 90 percent of the funds for their construction. ▲▲

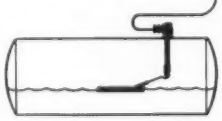


100% AUTOMATIC TANK GAUGING

Dependable remote reading tank contents gauges using a closed hydraulic transmission system. No power required.

Several sizes available. Approved by Underwriters Laboratories and Factory Mutual. UL approved switches.

Write for complete details, to Dept. C

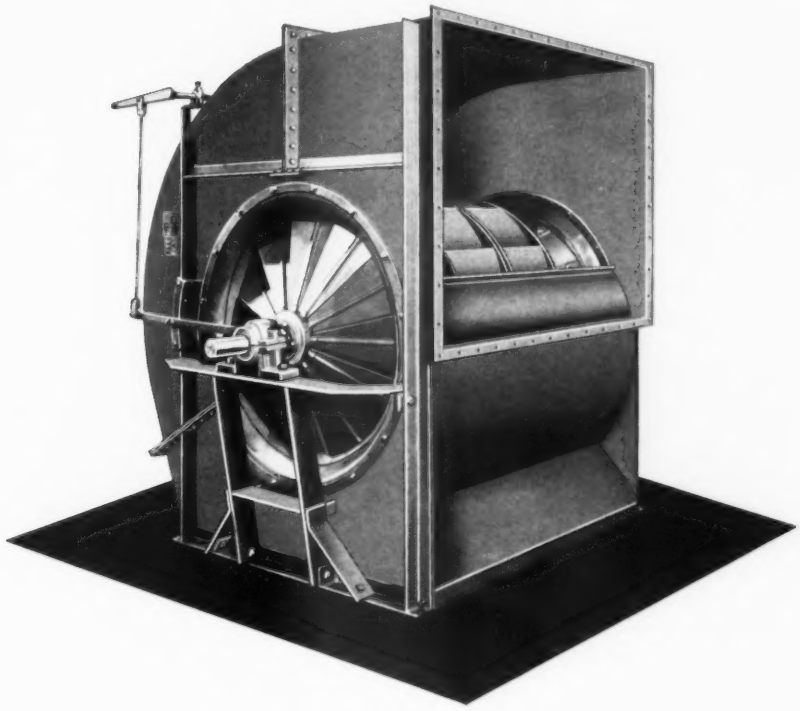


Since 1920 of proven quality

THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

CLARAGE

Presenting new highs in quietness and dependable broad efficiency...



NEW DYNAFOIL heavy-duty FAN

featuring a perfected airfoil blade design

With this new Clarage Type AF Dynafoil Fan you get stable high efficiency where it counts—under actual operating conditions.

Ideally suited to mechanical draft and heavy-duty applications, such as industrial processes, conduit type air conditioning, and tunnel ventilation, this latest in the Clarage line of superior fan equipment is built in 13 sizes, Classes II, III, and IV construction.

WRITE FOR CATALOG 859 which provides outlined dimensions and description of new Clarage Type AF Dynafoil Fans. Or contact nearest office.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

A message of interest to users of Solenoids

DETROIT COIL COMPANY

Sept. 29, 1958

Bussmann Mfg. Division
McGraw-Edison Company
St. Louis 7, Mo.

Gentlemen:

In the development of any product, accelerated endurance tests are of the utmost importance. Since our test facilities run unattended for a considerable period of time, it was always an unknown factor when a breakdown occurred; and whether the breakdown was the result of an electrical or a mechanical cause. Since our introduction of Fusetron fuses to this test equipment, we have eliminated this unknown.

For this test work, we need a protective device permitting normal operation of the solenoid, but in the event of mechanical or electrical breakdown, stop the test at a stage where the cause for failure could be examined before the evidence was destroyed.

Approximately two years ago, we started using Fusetron fuses on these tests. We found them to have an amazing consistency in their rating. Since then, where the proper size Fusetron fuses were used, it has been possible for us to determine the direct cause of electrical breakdowns.

We believe that if Fusetron fuses of proper size were generally used in the field, a great deal of coil replacement could be avoided — and resultant costly shutdowns, required while a solenoid is being repaired or replaced, would be eliminated.

This would be a boon to our service department, too, as it would cut down the number of service calls we have to make where the problem is not directly due to failure of the solenoid.

We feel that general use of the Fusetron fuse protection for solenoids would help both our customers and ourselves.

The size Fusetron fuse we use on normal applications is generally about 125% of the holding current rating of the solenoid.

Yours very truly,

DETROIT COIL COMPANY

E. A. Viale

E. A. Viale
Vice President

EAV-g

This amazing consistency is due to BUSS Engineering.

"A Great Deal of Coil Replacement could be avoided, and Resultant Costly Shutdowns Eliminated by Protecting Solenoids *with* FUSETRON FUSES."

E. A. Viale, VICE PRESIDENT
DETROIT COIL COMPANY

Protecting solenoids or other electrical equipment with FUSETRON Fuses—gives you greater safety, dependability and money-savings!

The BUSS Add-On Fuse Block for the protection of solenoids or Small Motors on Multi-Circuit Equipment

The BUSS Add-On fuse block makes it easy to protect equipment of any kind where a number of solenoids or motors are used.

Blocks are made up of single pole fuse blocks that interlock into a unit fuse block of any number of poles.

Poles may be added or removed . . . to either end of assembled fuse block. This makes it simple to have a fuse block of just the number of poles needed and to fit the block to available space.

Each fuse can be used as a circuit disconnect.

Specially designed fuse clips permit one end of fuse to be removed from clip and fuse raised to right angle to block where it is held firmly in position — see picture above.

When working on machine this makes it quick to identify circuit that is open — and it assures that proper fuse will be put back in right circuit.

Write for BUSS Bulletin BL-1.

BUSS and FUSETRON fuses are available to fit these fuse blocks in ampere sizes up to 30 and for voltages up to 250. Write for BUSS Bulletin SFB.

FUSETRON dual-element fuses provide 10 point protection against electrical troubles—unlike circuit breakers or ordinary fuses which, except in rare cases, protect only against short-circuits.

Fusetron Fuses remain safe — with no maintenance or recalibration required. They are calibrated at the factory by engineers. Once properly installed, they require no inspection and resulting downtime necessary on mechanically operated devices. There are no hinges, pivots or contacts to stick or get out of order. Dust, corrosion or oxidation cannot increase a Fusetron fuse's capacity or lengthen its blowing time.

After years of inactivity, a Fusetron fuse will give the same safe, dependable protection if called upon to open as it would have on the day it was installed.

For more information, write for . . . Bulletin FIS on Fusetron Fuses.

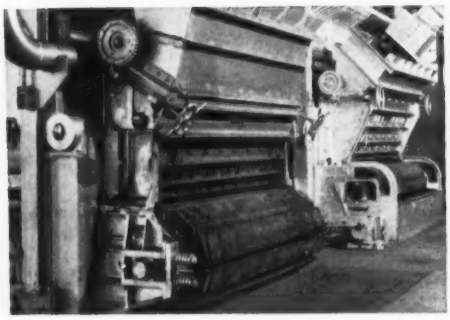
Bussmann Mfg. Division, McGraw-Edison Co., St. Louis 7, Mo.

159

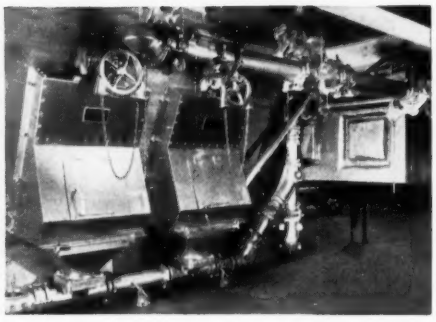
Play Safe! Install Fusetron dual-element fuses throughout entire Electrical System.

FUSETRON BUSS — TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION — McGRAW EDISON — BUSSMANN MFG. DIVISION · St. Louis 7, Mo.

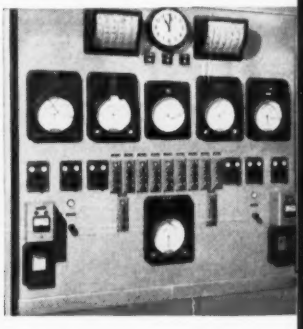
New 450 HP LW-80—world's largest coal hauler—is 12' high by 12' wide, 54½' long. It hauls 100 cubic yards (80 tons) per trip at speeds up to 34 mph.



View in the LeTourneau-Westinghouse boiler plant. In foreground is an Erie City 40,000 lb/hr type I.W.T. boiler, used on stand-by basis and for peak loads in very cold weather. At the right rear is Erie City 60,000 lb/hr main boiler. Both are fired by Combustion Engineering Inc. traveling grate stokers.



Shown are ash hoppers, part of United Conveyor ash handling system. Ashes are dumped from ash pits into hoppers from where they are piped pneumatically to silo. This system also handles dust from Prat-Daniel dust collectors.



Bailey Control Panel includes boiler meters & recorders, feedwater controllers and alarms, drum level recorders and alarms, gages for draft control.

From pit to plant, LeTourneau-Westinghouse moves with coal

Earthmoving equipment manufacturer estimates steam generated from coal costs only half as much as from competitive fuels

At LeTourneau-Westinghouse Co., Peoria, Ill., steam is used to heat an area that has swelled to a million square feet of space. Increasing demand created the need for a modern boiler plant to replace obsolete equipment. When plans were drawn for the new plant, fuel surveys indicated that the firm should continue to use coal for availability and economy. Estimates showed that steam produced from burning coal in this area costs about *half as much* as from competitive fuels.

Today LeTourneau-Westinghouse has found that burning coal in modern equipment cuts costs in several ways. Fuel costs, of course, are at a minimum. Automatic, efficient operation has lowered coal and ash handling costs. And manpower requirements have been reduced from 12 to 7 men.

Coal is lowest cost fuel

Today, *when the annual cost of fuel often equals the original cost of the boilers,* you should know that bituminous coal is the lowest cost fuel in most industrial areas. And modern coal-burning equipment gives you 15% to 50% more steam per dollar, while automatic operation trims labor costs and eliminates smoke problems. What's more, tremendous coal reserves and mechanized mining procedures assure you a constantly plentiful supply of coal at stable prices.

Technical advisory service

All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

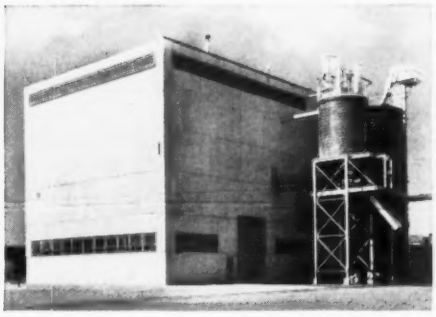
Send for FREE booklet

Meanwhile, we believe you will be interested in our informative case histories booklet, complete with data sheets. Send coupon below for your copy.

BITUMINOUS COAL INSTITUTE

Department CE-03, Southern Building, Washington 5, D. C.

See our listing in *Sweet's*



New heating plant showing 9000 cu. ft. Kalamazoo Tank & Silo Co. coal silo (on right). Coal moves by conveyor from track hopper to top of silo. Entire coal handling system by Beaumont Birch Co. To left of coal silo is Kalamazoo 25-ton ash silo equipped with United Conveyor dustless rotary unloader.

SEND COUPON FOR NEW BCI PUBLICATIONS. Guide Specifications, with complete equipment criteria and boiler room plans:

Bituminous Coal Institute, Southern Building, Washington 5, D. C.

Gentlemen: Please send me: **CE-03**

☐ GS-1 (low-pressure heating plant, screw-type underfeed stoker); ☐ GS-2 (high-pressure heating and/or process plant, ram-type underfeed stoker); ☐ GS-3 (automatic package boiler for heating and process plants). ☐ Case histories on larger plants.

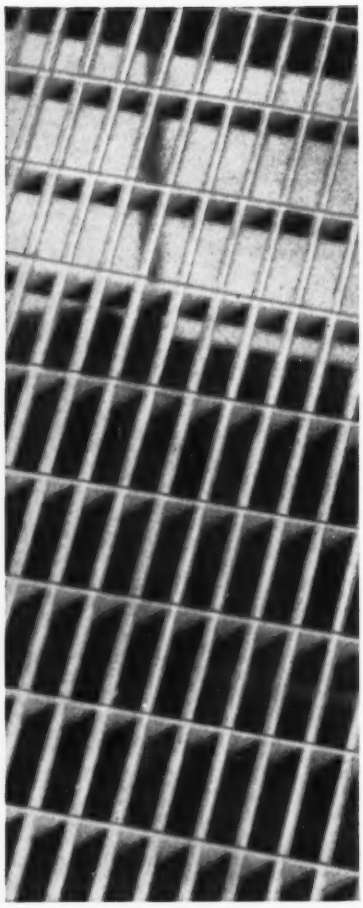
Name _____

Title _____

Company _____

Address _____

City _____ Zone ____ State _____



MITCO

takes the load
but not the light

Hendrick Mitco takes the brunt of heavy, continuous industrial or pedestrian traffic without bending or warping. Yet, its 90% open area lets in plenty of light and air. Mitco is pressure-formed to give it this high strength—and as a result, extremely long life. For more information, write direct to your local sales office.

Hendrick Mitco . . . *the grating with the Deep Cross Bar*

Hendrick
MANUFACTURING COMPANY
42 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

Men in Engineering

Arthur V. Peterson, nuclear engineer and administrator, has resigned as vice president of AMF Atomics, a division of American Machine & Foundry Company, and of AMF Atomics (Canada) Ltd., to establish Arthur V. Peterson Associates. The new firm will provide atomic energy consultation to industrial management and will be headquartered in Westport, Conn.

PETERSON GERBER

Alfred H. Gerber has been appointed chief estimator of The H. K. Ferguson Company, engineers and builders, of Cleveland, Ohio. In his new position, Gerber will supervise the preparation of all of the firm's engineering design and construction estimates. A registered engineer in both Ohio and New York, Gerber's most recent assignment was that of chief structural engineer in the company's main office in Cleveland.

Grant O. Hylander has been elected president of Ebasco International Corporation, service subsidiary of American & Foreign Power Company. Moving up from vice president, he succeeds Henry B. Sargent, who has been elected chairman of the board of directors. Hylander continues as an executive vice president and director of American & Foreign Power and as a director of Ebasco International.

The election of four new directors of Ebasco International also has been announced. They are: Myron G. Reed, Marvin S. Fink, T. M. Ireland, and S. A. LaFaso. Ireland, in charge of employee relations, and LaFaso, in charge of commercial development and publicity, also were named vice presidents. Fink continues as a vice president. Reed also is executive vice president in charge of operations for American & Foreign Power Company.

Two consulting engineer firms in Sheboygan and Milwaukee, Wisconsin have consolidated into one company. They are Jerry Donohue Engineering Co. of Sheboygan and Robert J. Strass, Inc., Milwaukee. New name of the firm is Hartman-Strass, Inc., with headquarters at 225 E. Michigan St., Milwaukee, Wis. Principals of the firm are Robert J. Strass, president and Bruno J. Hartman, executive vice president.

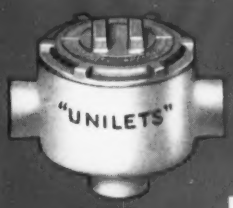
Engineering consultants Allen Johnson, P.E. and Paul Mulcey, P.E. have joined Fuel Engineering Company of New York as associates. Johnson, a mechanical engineer, specializes in the field of fuels and combustion and is coauthor of

FOR COMPLETE SATISFACTION AND SAFETY

APPLETON

INDUSTRY'S MOST ADVANCED LINE

EXPLOSION-PROOF EQUIPMENT



JUNCTION UNILETS

LIGHTING FIXTURES

RECEPTACLES

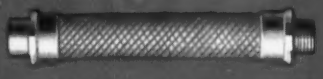
SWITCHES

Explosion-proof electrical equipment is more important today than ever before. Manufacturers of material handling equipment are adding explosion-proof switches and connectors to be used in hazardous areas. And, an ever increasing number of industrial plants are almost entirely equipped with explosion-proof electrical equipment. Appleton's full line of explosion-proof electrical equipment is the result of extensive laboratory development and field tests, with your individual safety requirements in mind. Proven acceptance and use by leading companies the world over is your assurance that APPLETON is...

TODAY, MORE THAN EVER...

The Standard for Better Wiring®

LINE STARTER UNILETS



FLEXIBLE COUPLINGS

EXPANSION UNIONS

CIRCUIT BREAKER UNILETS

Sold Through Franchised Distributors Only

APPLETON ELECTRIC PRODUCTS®

Also Manufacturers of

Industrial Lighting

Outlet Boxes

"ST" Series Connectors

Malleable Iron Unilets & Covers

Automatic Reelites

APPLETON ELECTRIC COMPANY 1734 Wellington Avenue • Chicago 13, Illinois

Fuels and Combustion Handbook. Mulcey has acted as consultant in the field of research and fuel utilization for the governments of Peru and Turkey.

Daniel W. Klar, engineer with Wilsey and Ham, Engineers and Planners, of Millbrae, Calif. has been awarded a special commendation by the United States Atomic Energy Commission. Klar was singled out for his recent work as resident engineer on a Wilsey and Ham project at the Commission's Livermore, California site.

C. E. Mauk, F. E. Van Sickle, Associated Consulting Electrical Engineers, have moved their office to 704 South Spring Street, Suite 810, Los Angeles 14, California.

Sterling F. Smith, former senior executive officer of Consultants, Inc., has resumed active participation in the operations of Darby Associates, engineers and analysts, of Washington, D. C. Smith, senior engineering associate of Darby Associates, continues as a staff consultant for Consultants, Inc.

Charles C. Whittelsey, president of Ford, Bacon & Davis, Inc., engineers and business consultants with offices in New York, Chicago, and Los Angeles, has been elected chairman of the board succeeding Everett S. Coldwell, who has retired after 33 years of service with the firm. Whittelsey continues as president and chief executive officer of the firm.

WHITTELSEY

COLDWELL

Professor John F. Lee, a member of the North Carolina State College faculty since 1952, has been named head of the Department of Mechanical Engineering. Lee, who was made Broughton Distinguished Professor of Mechanical Engineering last September, is recognized as one of the nation's leading engineering educators. He authors "Atoms in Action" in CONSULTING ENGINEER, and is editor of *Nuclear Engineering* magazine, published by Consulting Engineer Publishing Co.

Ralph Eberlin, consulting engineer of New York City, announces the formation of a new firm, Eberlin and Eberlin, Consulting Engineers, in partnership with his son, Monroe M. Eberlin. The organization, located at 123 East 77th Street, New York City, offers consulting civil engineering services, specializing in site engineering and site planning

Major Oil Company SPECIFIED THERMAL

Two big Thermal central plant units were specified by a major oil company with headquarters in Houston for the year-round air conditioning of its Data Processing System. This same company has many other installations of Thermal air conditioning equipment in its several plants and office facilities.

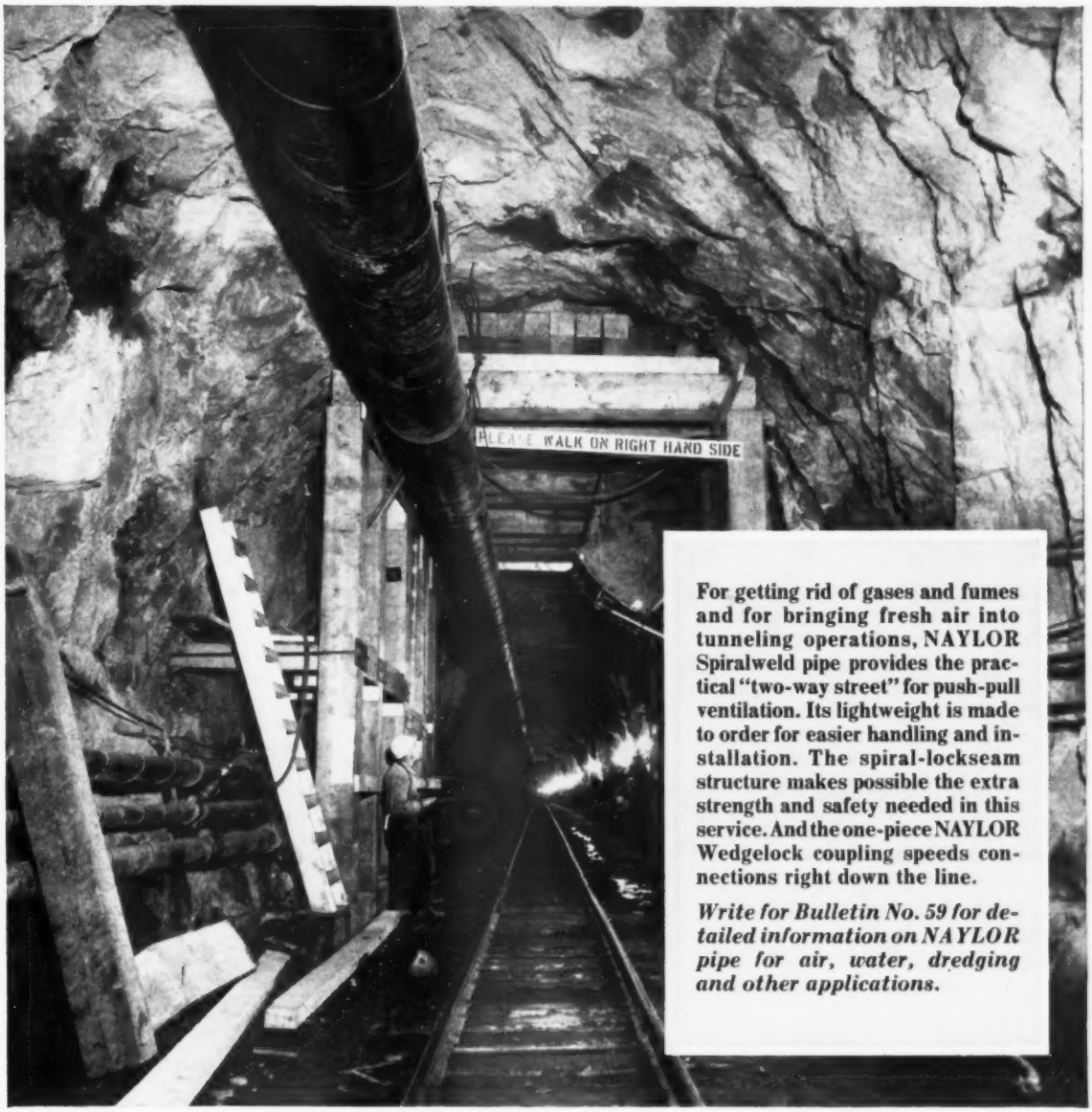
The Thermal line includes central plant air conditioners; multi-zone air conditioners, sprayed coil units; heating and ventilating units, cooling and heating coils and air-cooled condensers. For air conditioning and ventilating equipment that can be relied on for efficiency, long life and economical operation, see your Thermal Engineering agent.

Agents in principal cities.
Quality Products Since 1945.

THERMAL ENGINEERING CORPORATION

2605 W. DALLAS • P. O. BOX 13254
HOUSTON 19, TEXAS

TWO-WAY STREET
For Ventilation



For getting rid of gases and fumes and for bringing fresh air into tunneling operations, NAYLOR Spiralweld pipe provides the practical "two-way street" for push-pull ventilation. Its lightweight is made to order for easier handling and installation. The spiral-lockseam structure makes possible the extra strength and safety needed in this service. And the one-piece NAYLOR Wedgelock coupling speeds connections right down the line.

Write for Bulletin No. 59 for detailed information on NAYLOR pipe for air, water, dredging and other applications.

NAYLOR PIPE *Company*

1276 East 92nd Street, Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 60 East 42nd Street, New York 17, N. Y.

in connection with the design and construction of airfields, roads, subdivisions, housing, schools, and shopping centers.

James A. Lindsey, head of Lindsey Engineering Company, announces a new office location at 129 West Lake Street, Minneapolis 8, Minnesota. The firm was founded in Hutchinson, Minnesota, in 1953 and moved to Excelsior in 1955. In 1957, Lindsey became the co-founder and president of Lindsey, Carter & Associates, Inc. The firm now has been divided into two parts with the re-establishment of Lindsey Engineering Company.

Tumarkin, Morgan and Emerman, consulting engineers of New York City, announce the retirement of Samuel Tumarkin and Alexander M. Emerman. The firm will continue consulting engineering services under the supervision of the remaining partners, Egbert P. Morgan and Irwin Emerman.

Houghton R. Hallock has joined the consulting engineering firm of Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa., as director of the general engineering division. He formerly was executive vice president of The Texas Atomic Energy Research Foundation.

HALLOCK HASTINGS

James M. Hastings has been named a partner of Ketchum & Konkel, consulting engineering firm of Denver, Colorado. Hastings has been an associate of the firm since 1955. In line with this appointment, the firm name has been changed to Ketchum, Konkel & Hastings.

Professor Charles M. Spofford, sole survivor among the founders of Fay, Spofford, & Thorndike, Inc., consulting engineers of Boston, Massachusetts, and recognized international authority on bridge design, has been awarded the Frank P. Brown Medal of the Franklin Institute. Established in 1938, the Brown Medal is awarded as recognition to inventors in the building and allied industries by the 134-year old scientific institute. Professor Spofford received this distinction for the engineering, aesthetic, and educational contributions to the civil engineering field during his long career.

The firm also has announced the appointment of five directors to the office of vice president simultaneously with its decision to open a new branch office in Phoenix, Arizona. The new vice presidents are: Edward C. Keane, Burdette K. Bee-

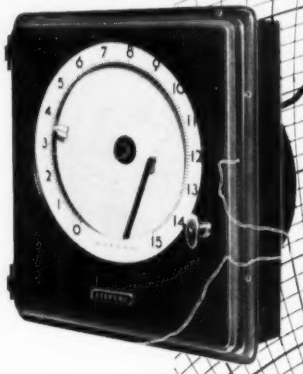
ACCURATE GRAPHIC AND VISUAL REGISTRATION

of liquid flow with

STEVENS

RECORDER TYPE B-FT

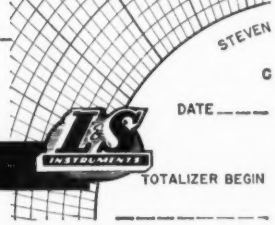
Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears . . . an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.



This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

STEVENS HYDROGRAPHIC DATA BOOK

Invaluable for your reference file. Contains technical data on recorder installations, plus a wealth of hydraulic and conversion tables. $1 copy. (No COD's)

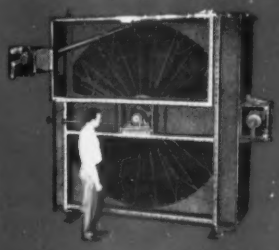


LEUPOLD & STEVENS INSTRUMENTS, INC.

4445 N. E. GLISAN STREET · PORTLAND 13, OREGON

Specialists in hydrologic instruments for over half a century.

Here's what you can do about the high cost of fuel.



Get the same heat from cheaper fuel with a

LJUNGSTROM® PACKAGE AIR PREHEATER

You can get standard operating temperatures from the cheaper fuels if combustion temperature is high enough. Peat, bagasse or even wood can be used successfully. The Ljungstrom Air Preheater can increase combustion temperature by as much as 300° by recovering heat from the exhaust gas. This reclaimed heat would otherwise go up the stack. All it costs is the price of the preheater—and the Ljungstrom can save enough on fuel to pay for itself in approximately two years.

You can be sure of maximum heat recovery because the Ljungstrom's exclusive rotary heat transfer element picks up the heat from the exhaust and puts it back into the combustion air without passing it through partitions or tube walls. Package design gives you all the advantages and economies of the Ljungstrom in a compact, preassembled unit. The Package Ljungstrom is available in vertical or horizontal models that are readily adaptable to any plant arrangement.

For further information, write today for the free 14-page Package Ljungstrom manual.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

be, Fozi M. Cahaly, Leon B. Turner, and Harold H. Jones.

The firm of Roberts, Merriman & Bowden has changed its name to Roberts, Merriman, Bowden and Isbell, and has moved one of its offices to 117 North Frost Street, Pampa, Texas.

Stockholders of The Austin Company, Engineers and Builders of Cleveland, Ohio, have elected three new directors: L. Paul Gilmore, vice president-secretary-treasurer of the company; James R. Stewart, general counsel; and A. T. Waidelich, vice president. Waidelich also was elected director of engineering and research, succeeding J. K. Gannett who has retired.

Two new vice presidents also were elected: Hamilton Beatty, who continues as manager of sales development, and D. H. Kempler, who also is general auditor.

Directors re-elected are: George A. Bryant, chairman of the board; Allan S. Austin, president; Harold A. Hallstein, retired vice chairman; Harold A. Anderson, executive vice president and general manager; Albert S. Low, vice president and southwestern district manager; and A. Fletcher Plant, vice president and Detroit district manager.

WAIDELICH BARRETT

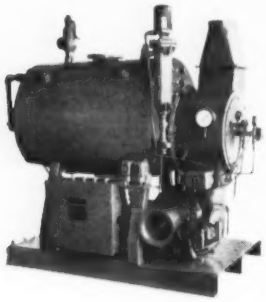
Elmer S. Barrett has been elected president and chief engineer of Photronix, Inc. of Columbus, Ohio, an engineering service organization specializing in applications of aerial photogrammetry and electronic computation. Barrett succeeds Everett S. Preston who has severed all connections with the company he founded to become Director of Highways of the State of Ohio.

Barrett also was elected chairman of the board of managers of Barrett Associated Engineers, a consulting engineering partnership associated with Photronix, Inc. and formerly known as E. S. Preston Associates. Head of his own consulting engineering firm, Elmer S. Barrett Associated Engineers of Chillicothe, Ohio, Barrett also will continue in this capacity in addition to his new posts in Columbus.

At its recent meeting in Sacramento, the California State Board of Registration for Civil and Professional Engineers elected S. B. Barnes, civil and structural engineer of Los Angeles, as president and G. M. Simonson, consulting engineer of San Francisco, as vice president. Both men have served on the Board since 1954.

from TXT

Steam Generators and Heaters to specify for efficiency, economy and client satisfaction

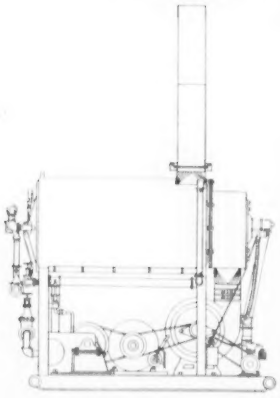


VAPORMATIC COIL-N-SHELL STEAM GENERATOR—A compact, forced circulation, water tube type steam generator . . . requires minimum space . . . has more steam generating capacity . . . delivers big horsepower.

Steam outlet pressure: 5 to 150 p.s.i.g.

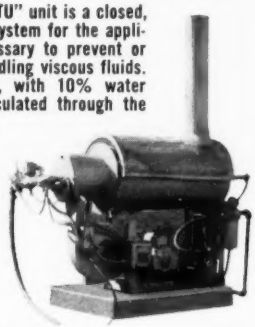
Horsepower range: 35 to 300.

Completely automatic. Modulating Controls. Generates steam from cold start in ten minutes.



25-A HEATER—Specially designed for asphalt plants, the 25-A Heater utilizes hot oil to keep asphalt fluid at lower cost with higher efficiency. It has fully automatic controls and approved ASME construction. Provides accurately controlled temperatures to 600 deg. F., utilizing low pressure vessels and flow circuits. Completely protected from freezing conditions. Standard units are available with output capacities of 300,000 to 2.5 million BTU'S per hour.

"BTU" HEATER—The "BTU" unit is a closed, forced circulation heating system for the application of heat where necessary to prevent or correct trouble in lines handling viscous fluids. Heat-transfer oil or water, with 10% water soluble oil content, is circulated through the heater coils and raised to a pre-selected temperature. It is then pumped through a heat exchanger where heating of the commodity takes place.



The "BTU" Heater automatically maintains selected temperature; is completely safe, cannot explode and is equipped with safety guards on all rotating parts. Its capacity is 300,000 BTU's per hour; maximum heat transfer oil temperature is 500 deg. F.

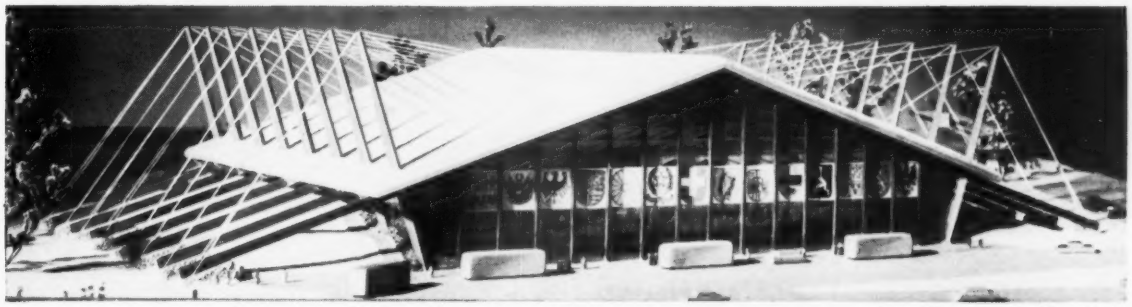
TEXSTEAM CATALOG—This complete data and specification file is a convenient, ready reference for sizes, dimensions, and capacities of TEXSTEAM heaters and steam generating equipment. Write for your copy of this complete, three-ring binder catalog today.

TXT TEXSTEAM Corporation

A SUBSIDIARY OF VAPOR HEATING CORPORATION

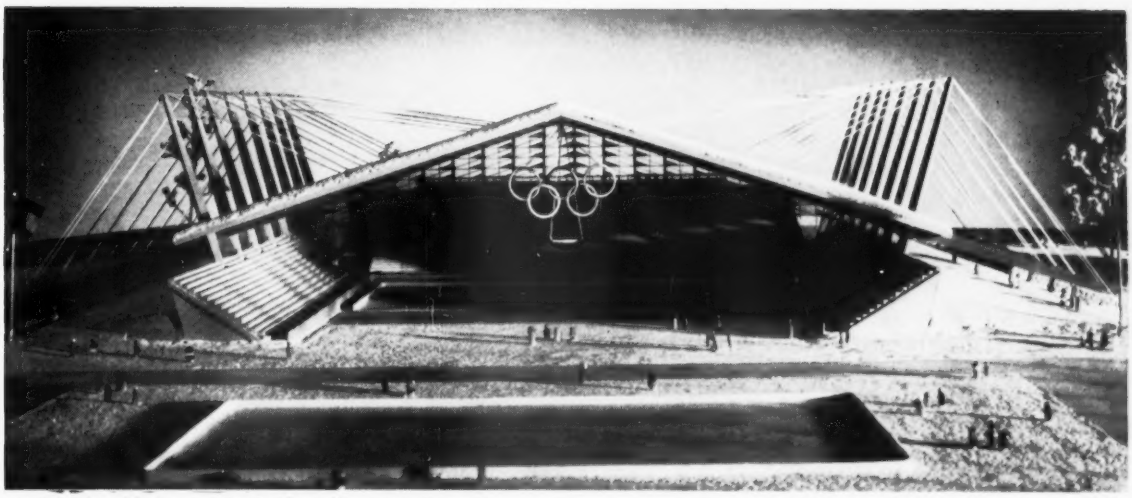
320 HUGHES ST. · P O BOX 9127, HOUSTON 11, TEXAS · PHONE WA 6-8852

New Suspended Roof Ice Arena for 1960 Olympics



Architects: Corlett & Spackman, A.I.A., Kitchen & Hunt, A.I.A. • Structural Engineer: H. J. Brunnier • General Contractor: Diversified Builders • Steel Subcontractor: Pittsburgh-Des Moines Steel Company

"...a marvelous sense of bigness"



Architects' model of arena, showing dramatic open southern side.

In Squaw Valley, California, work is currently under way on the 1960 Winter Olympics Ice Arena. Unique in many respects, this soaring structure has a 300 ft clear span suspended roof, supported by 96 pieces of 2¼ in Roebling prestretched galvanized bridge strand. This strand was furnished socketed with no provision for take-up at the construction site. Each piece was fabricated to *exact* dimensions at the mill.

The main frame, providing the 300 ft clear span, consists of tapered steel columns, tapered steel box girders, and the inclined cable tension members, on 32 ft centers. Each half of this frame acts independently—in somewhat the same manner as a guy derrick, with the roof girder functioning as the boom, the column as the mast, and the inclined cables as the guys. Rolled steel beam purlins on 11 ft 4 in centers span the 32 ft between main frame girders and support the cellular steel deck roof.

Many factors had to be considered before design recommendations of any kind could be made; valley topography, snowfall, cost, specific needs of competing countries in the Olympics, etc. The suspended roof principle most fully met all requirements, both aesthetically and practically. Most interesting is the arena's open southern side which permits an unobstructed view of the valley with its speed skating rink and ski jumps. During activities in the arena, the open end will be partially closed by movable bleacher sections mounted on portable tracks.

The frequency with which architects, designers and engineers are utilizing the suspended roof principle for transportation terminals, gymnasia, convention halls, etc., is indicative of the beauty and economy of this method.

Roebling's interest in, and activities on behalf of, suspended roofs stems directly from its leadership in all forms of *steel in tension*. This leadership puts Roebling in the position of being able to share with you its findings, conclusions and theories covering all phases of suspension systems. We will be pleased, at any time, to discuss with you this knowledge. Just write Bridge Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

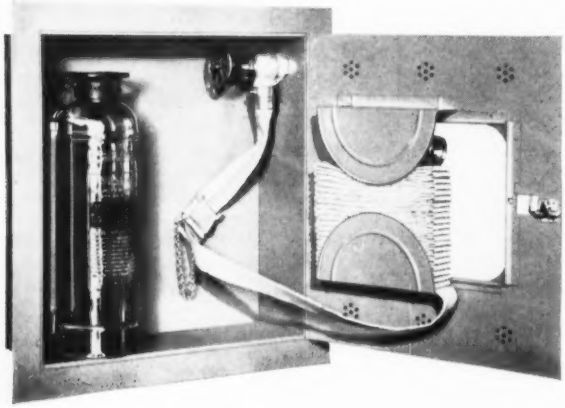
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

New! Fire hose cabinet with

RACK SWINGS FULL 180°

Now, when seconds count, there's no delay in fire-fighting . . . user just grabs the hose and runs! The hose is racked on the *door* instead of inside the cabinet. This door swings out—a full 180°—

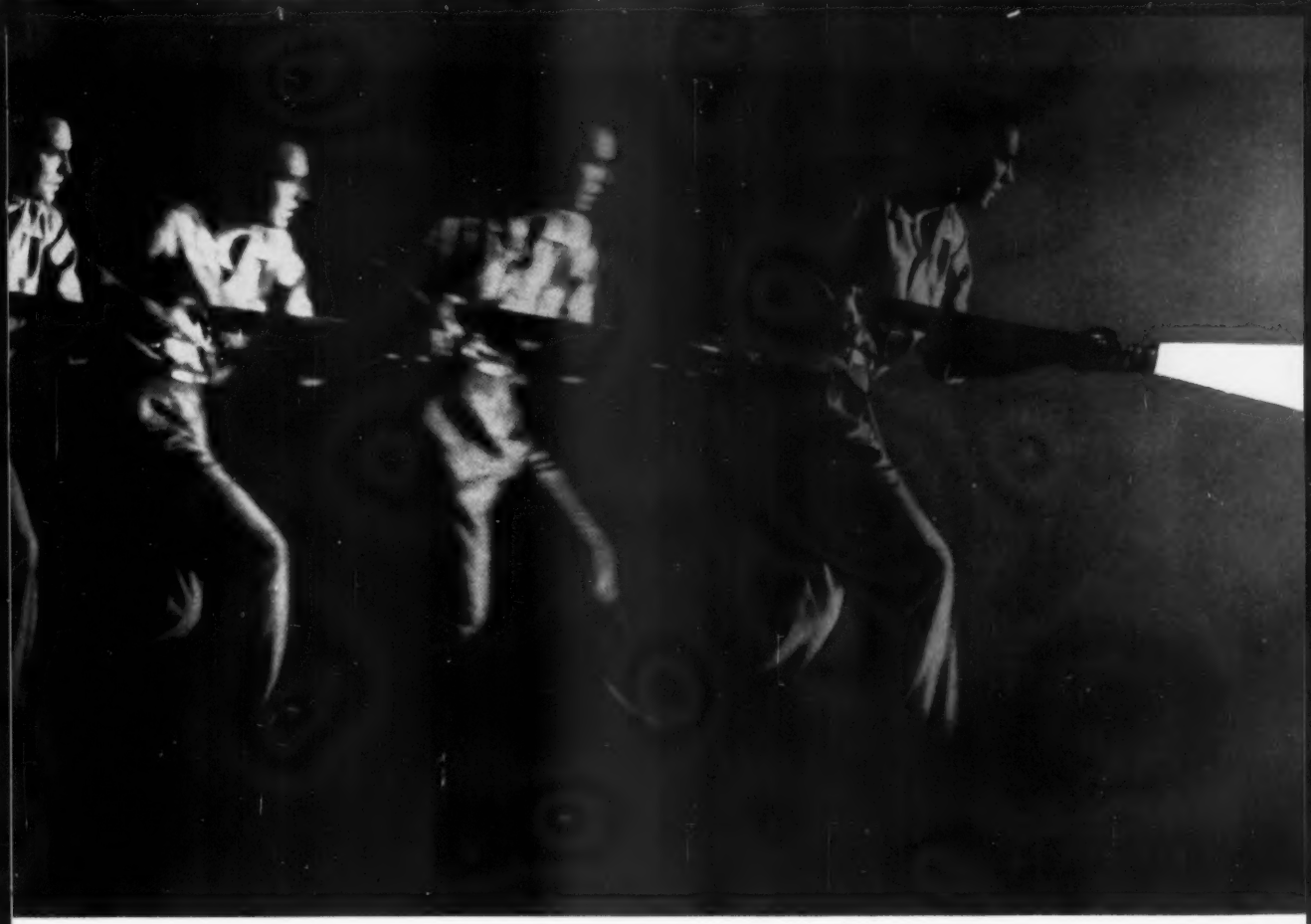


NEVER FOULS HOSE LINE

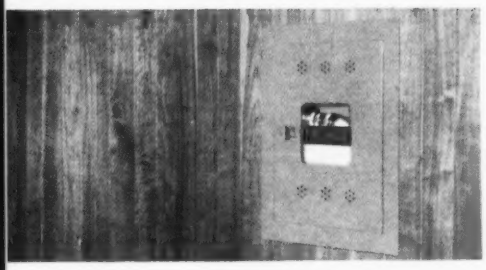
and the hose can't snag when it's needed most. The new Allenco Hozegard cabinet is the first fire hose cabinet equipment to be *completely* Underwriters listed! Each Hozegard installation saves 25% to 30% by eliminating the expensive pin-type rack and the time needed to install the hose on it.

Allenco Hozegard cabinets are available with or without extinguishers and with Fire Department valve when desired. There is a choice of sizes and styles to fill most every requirement. All have steel cabinet with frame welded to body . . . hold up to 100 feet of 1½" linen hose. When specified with exclusive Hose Clip, the entire unit—cabinet and equipment—is 100% U/L listed.

SPECIFY ALLENCO . . . QUALITY FIRE PROTECTION SINCE 1887 • STANDPIPE EQUIPMENT • EXTINGUISHERS • HOSE • REELS • FIRE DEPARTMENT CONNECTIONS



FOUL-PROOF door rack



NOTE TO THE DESIGNER

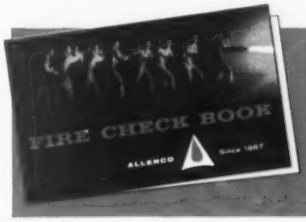
You'll appreciate the contemporary styling of Allenco Hozegard cabinets. Designed to complement interior decor, they actually blend with the beauty of your building.

Requiring 35% less area—less depth, the compact Hozegard cabinet can be flush-mounted in any wall, or in the floor! The cabinet door is available in several styles and choice of 3 trims . . . custom-finished at the factory or on-the-job to your specifications.

Free swinging door rack means foul-proof withdrawal and ready aiming at fire.

Exclusive hose clip makes cabinet semi-automatic—perfect for one-man operation.

Tamper-proof glass latch shield is scored for safe, easy breaking in emergency.

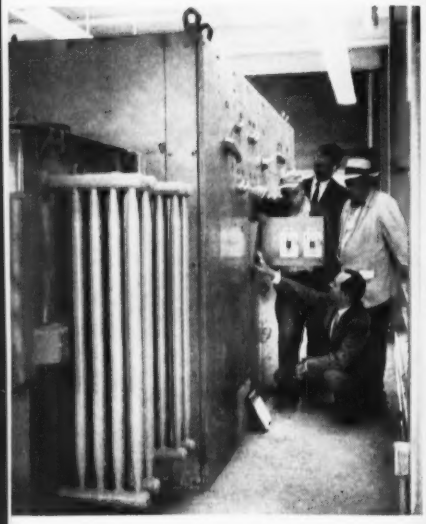


WRITE TODAY for FIRE CHECK BOOK! Shows basic requirements for: Standpipe System; Hose Stations; Extinguishers; Exterior Centers. Prepared in convenient file size, the check book includes "coupon specifications" forms which simplify and speed spec-writing.

W. D. ALLEN Manufacturing Co.

650 South 25th Avenue • Bellwood, Illinois

View from pump floor in Oswego, New York, pumping station showing one of main pumps being driven by Westinghouse 300-hp vertical synchronous motor above.



Robert B. Stannard, Resident Engineer for Nussbaumer, Clarke and Velzy, Consulting Engineers Karr Parker, Jr., Buffalo Electric Co.; Kenneth D. Jensen, Superintendent, Department of Water, Cswego; and M. B. Trimble, Westinghouse Construction Sales Engineer, discuss "tilt-out, lock-out" feature of the control center. Westinghouse double-ended control power center has 300-kva Inerteen® transformer at each end.

Oswego water pumping station Powers-Up to attract new industries

The modernization and expansion program of the Department of Water, Oswego, N. Y., provides an interesting example of building today for tomorrow's needs. While planning for today, Oswego's Water Board recognized that a good water supply is an indispensable commodity in attracting new industry to the area. By Powering-Up electrically, their new pumping station has electrical capacity five times present demand to allow for future growth.

Present demands for water are approximately 10 million gallons per day. Installed pumping capacity is capable of providing more than 20 million gallons per day. In addition, provision has been made to increase capacity to 35 million gallons per day when required by future demands.

The new pumping station is supplied with lake water from an intake tunnel which extends through solid rock for a distance of 6250 feet into Lake Ontario. This tunnel intake averages eight feet in diameter and is capable of conveying 128 million gallons of water per day.

Electrical power for the station is available from two separate sources—one direct from the Oswego Steam Station and the other from the Niagara-Mohawk Varick Station. The complete electric distribution system, as furnished by Westinghouse, provides for all anticipated future expansion of the pumping station.

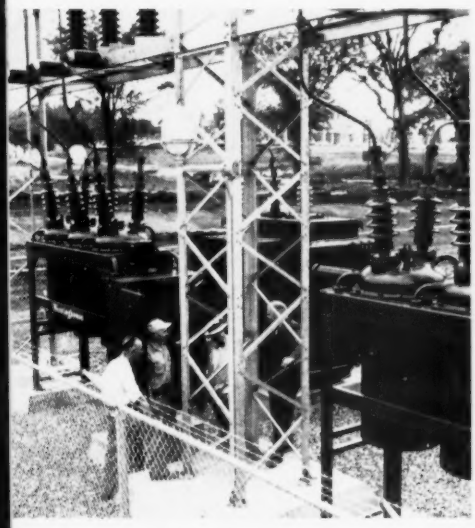
Powering-Up electrically for future growth can offer important advantages to you. For further information, call the Westinghouse electrical engineer nearest you, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.
J-94119

Owner: Department of Water, Oswego, N. Y.
Consulting Engineers:
Nussbaumer, Clarke and Velzy
General Contractor: McElwee-Courbis Const. Co.
Electrical Subcontractor: Snyder and Mackin, Inc.
Westinghouse Distributor: Buffalo Electric Co., Inc.

Over 250 Pages Westinghouse Data in Sweet's Construction File.

YOU CAN BE SURE...IF IT'S
Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS"
CBS TV MONDAYS



Leo J. Landrigan, Superintendent, Oswego Pumping Station; Richard C. Mansfield, Foreman for Snyder and Mackin, Electrical Contractors; Kenneth D. Jensen; and Charles T. Hansen, Westinghouse Sales Engineer, at outdoor substation which serves new Oswego pumping facility. Two Westinghouse 2000-kva power transformers and two Westinghouse 34.5-kv oil circuit breakers are included in this substation.

Main floor view in pumping station shows four Westinghouse vertical synchronous pump motors with the glass enclosed control room in background. The mezzanine floor above is occupied by Westinghouse 2300-v, heavy-duty, metal-clad switchgear, using Type DH air circuit breakers.

Another view of main floor shows reverse side of control room and, on the mezzanine, Westinghouse double-ended control power center. Floor openings in foreground, not shown, have been provided for the installation of four additional raw water pumping units when filter plant is added.

NEW
GUTH KOLORKODED* industrial fixtures with built-in

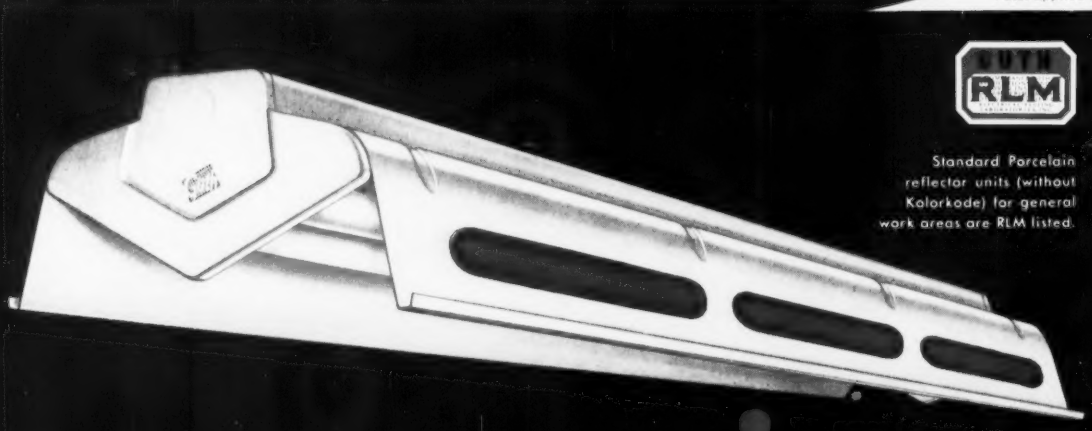
Designed to direct traffic, protect your workers, identify various plant or storage areas . . . and create new standards of seeing-efficiency for greater productivity.

They "wash away" ceiling shadows, yet assure high footcandles with comfortable shielding for the working level: 10% uplight with 13° cut-off or 25% uplight with 27° cut-off . . . for 430, 800 or 1500 M. A. operation. Easy installation and maintenance. Three reflector finishes—Permalux White, Porcelain or Alzak Aluminum.

WRITE FOR FREE KOLORKODED BULLETIN

TRAFFIC LIGHTS

*Copyright &U.S. & Can. Pats. applied for.



GUTH RLM

Standard Porcelain reflector units (without Kolorkode) for general work areas are RLM listed.

at exits, fire protection systems, keep-out areas, etc.

at stairs, curbs, dead ends and other hazard areas.

in aisles, safe storage, first-aid, etc.

Guth LIGHTING

THE EDWIN F. GUTH CO.
2615 Washington Blvd., St. Louis 3, Mo.
TRUSTED NAME IN LIGHTING SINCE 1902

485

Books

Parallel Reading for Consulting Engineers

EARLY THIS MONTH we received two books from the same publisher, and it is hard to believe they could have issued from one womb. Both are out of Dutton – but one is by Rickover, the other by Pollack. Rickover, Admiral of the Atom Sea, has put together an argument (largely taken from talks and papers he presented in the past three years) that already has influenced education in this country – and the end is not. Pollack (Philip) has not yet, we hope, influenced anyone.

Pollack's book, *Careers and Opportunities in Engineering*, offers an excellent scientific excuse for book burning. Its great value is in its Btu content. It could hardly be termed dangerous, for anyone capable of finding a career or opportunity in engineering should realize that this piece was batted off at Mach 3 after a few standing interviews with engineers, engineering instructors, and magazine editors. We admire men who can write this way; it is only their books we dislike. The result of Pollack's effort is a surface description of the several branches of engineering more accurately and interestingly presented in *The Young Engineers Out West* or *Tom Swift and His Flying Machine*. Pollack's appendix gives a good example of the accuracy of the material and the familiarity of the author with his subject. It lists "the leading American organizations in the field of engineering" without mention of the National Society of Professional Engineers, but it includes the Los Angeles Council of Engineering Societies and the Kentucky Society of Professional Engineers. It also provides a list (1956) of what it refers to as "EJC accredited institutions" of learning. The Engineers' Council for Professional Development may be a bit upset in having their accrediting privileges turned over to EJC in this offhand manner, but it may be nothing more than a new approach to unity demanding further investigation. The author also shows a total lack of understanding of registration, which he refers to as "a new category of engineers" and which he seems to feel is some sort of special award received by engineers who have four years experience and then "pass special examinations."

It is unlikely that this book will have much sale, but it may be ordered by high school guidance teachers who judge from the title that it could lead their young people toward an adjusted life in applied science. Fortunate is the high school library too short of cash to invest in this.

As Rickover Sees It

Rickover's volume is something else. Where Pollack misleads the pupil, Rickover picks apart the pedagogue and points the proper way for our professional educators. His theme is a simple one. We should revise our educational objectives so that each pupil is given the opportunity to receive the best education his mind can handle. Rickover feels that too long there has been a misunderstanding of education's relation to democracy; the emphasis has been on equal education when it should have been on equal opportunity to go as far as the mind is capable. He also has considerable scorn for social adjustment courses. It is agreed that happiness is a legitimate goal of the individual, but this does not mean that each man must conform to some Pablum-bland standard. Only in the guise of the Hollywood character is the nonconformist readily accepted by the American public. The eccentric intellectual is ostracized unless he has his "human" side and can be seen occasionally sneaking off to a Sunday ball game "like other people."

Many of Rickover's recommendations have been adopted by public schools. In the past year high schools have added stiff, new courses in mathematics and languages. Large numbers of quite normal children now are taking an extra year of Latin after regular school hours, and six and seven year olds are not infrequently found chatting in French or Spanish over their modeling clay.

This is likely to be surface stuff tossed as a sop to local Rickover fans, and there is little doubt that Dewey-eyed administrators will drop these courses in favor of advanced drivers' training and practical bowling alley management whenever they think the intellectual's hysteria has passed its peak. Perhaps the peak has about been reached, so Rickover's *Education and Freedom* may have left the press just in time to help slow the slide back into the lush valley of super social adjustment.

Rickover's self-assigned task is no easy one. Over a hundred years ago de Tocqueville pointed out that one danger in democracy lay in a tendency toward domination of taste and intellect by the masses. The intellectual as well as the political aristocracy are likely to lose their heads in democratic society.

It will be quite an accomplish-

ment if Admiral Rickover and all his men can put the eggheads together again.

Pepys, Adams, and Auctions

Unfortunately, we were not able to appreciate the remarkable generosity of the publishers in sending us, this month, such a large number of review copies of their latest works. We were interrupted by some rather unusual luck at the auction block. Of late we have taken a renewed interest in the books offered by a New York auction firm. Book auctions are almost as interesting as the sales of household goods we once attended between school and supper time. At one of these we were fortunate enough to bid a high 75¢ for a wicker jai alai racket, an item we have used often as an example of the relative wisdom of subsequent purchases.

Book auctions have the advantage that one does not have to attend to participate. The auctioneer mails you a catalog describing the books he is to sell at some specified future date. You then mail back a form showing your high bid for any books in which you are interested. If yours is high among the mail bids, he represents you at the actual sale and bids until he either gets the book for you or the bidding goes beyond your limit.

We have always had fair success in this auction-by-mail, but in the last month we have been pushing our luck. We have managed to buy every book on which we bid, even when making a foolishly low offer.

Last week we went home one evening to find the dining room table covered by a nine volume edition of *Pepys' Diary* (bid at $10.00 and got for $7.50). The type is a trifle small, but it is the Wheatley edited edition and as complete as can now be had. It took several nights to deal with the first volume, for it had been years since we spent much time with the lively Secretary to the Admiralty.

We were taken from Pepys' only by the arrival of another book from the auctions. This time it was an excellent copy of *The Letters of Henry Adams 1892 - 1918*. This is the second volume of Adams' Letters collected and edited by Worthington Ford, published in 1938. The 1858 - 1891 letters were published eight years earlier. Current interest in the writings of Henry Adams is second only to the boom in Boswell, a situation most disturbing, no doubt, to the ghost of that peripatetic recluse. Some of this new respect can be attributed to the good reviews given Ernest Samuels' new biography, *Henry Adams – The Middle Years* (Harvard) but more likely the movement is one lead by readers rather than by authors and publishers. Samuels probably found his book swept along in the Henry Adams revival much as Tolstoi had Napoleon swept to Moscow by forces not his own.

It is wrong to refer to a revival when speaking of Adams' popularity. He never really had any popularity with the public. His *History* did fairly well, and the *Education* received the reverent respect of young English professors and elderly librarians, but he denied his *Democracy* and left *Esther* a bastard. His *Letters*, the best material yet published by or about Henry Adams, are not currently in print except in a "selected" edition from Farrar Straus. He was appreciated only by the small but important circle that knew him personally, and he never wanted, or never admitted that he wanted, public acclaim.

Adams was a man more alive than most when he thought himself dead. In his pessimism he makes the modern beatnik writhe in envy, yet his unconcealable interest in all things breaks through this sullen cloud cover. He can pull you away from Pepys' bedroom window just to explain Grover Cleveland's foolish handling of the free silver problem.

Adams is responsible also for our only mistake in book buying this month. We bid on a copy of Augustus Saint-Gaudens' autobiography simply because he was a friend of Adams. Saint-Gaudens did quite well with his sculpture; he should have left literary endeavors to his friends. Fortunately, it is well illustrated and well bound.

— For the Office —

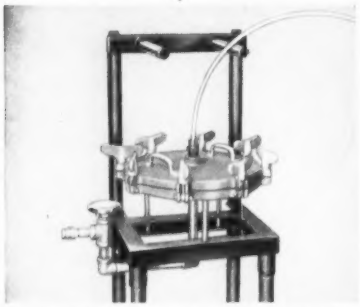
ELEMENTARY STATISTICAL PHYSICS, by Charles Kittel; John Wiley & Sons, Inc., N. Y.; 228 pp.; $8.

Reviewed by
Isadore Hausser
Illinois Institute of Technology

Although this text on statistical mechanics was written for beginning graduate students of physics, it also can serve as an introduction to the subject for engineers. Its emphasis on current problems will be of particular interest to those already familiar with the theory.

Applications useful in chemistry, metallurgy, electronics, and nuclear

NEW PRODUCT



BARNSTEAD "MF" SUBMICRON FILTER FOR REMOVAL OF PARTICLES TO 0.45 MICRON

This new Barnstead "MF" Submicron Filter for either distilled or demineralized water, has been developed to remove submicroscopic particulate matter which may cause trouble in some of the new processes in electronic and nucleonic fields. The Barnstead "MF" Submicron Filter will filter out particles as small as .000016 inches, thus permitting a filtering technique not before possible on a production basis.

Each Barnstead "MF" Filter plate can filter up to 100 gallons per hour. Multiple plates can be employed to obtain larger flow rates.

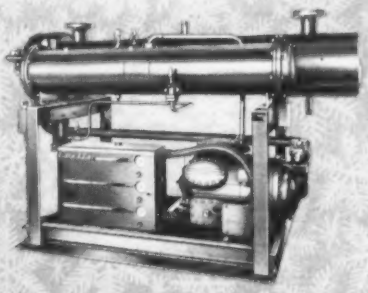
Write for new bulletin #141 to the Barnstead Still and Sterilizer Co., 44 Lanesville Terrace, Boston 31, Massachusetts.

Curtis

CONDITIONS COMMERCIAL AMERICA...

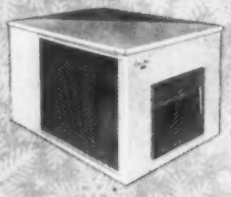
Curtis packaged units minimize floor area required. Factory assembled and tested. Field installation requires only setting and connecting utilities.

PACKAGED AIR CONDITIONERS UP TO 100 TONS.



PACKAGED LIQUID CHILLERS UP TO 100 TONS.

AIR-COOLED UNITS UP TO 10 TONS.



PRECISION

close tolerance manufacturing, builds peak performance into every CURTIS unit.

Curtis is the "luxury line" in the air-conditioning industry. Silence, efficiency and long-life are inherent in Curtis design.

Yet Curtis prices are right in line.

This is why Curtis designs and builds thousands of unique air conditioning systems for commercial America . . . why Curtis is able to maintain a family of over 300 representatives and servicing contractors across the nation.

Put the advantages of CURTIS PRECISION into your next job.

Curtis

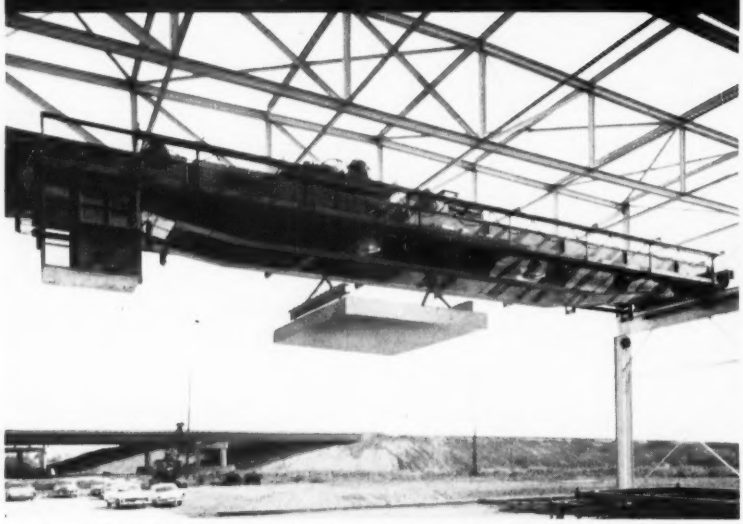
MANUFACTURING COMPANY
REFRIGERATION DIVISION

OUR 105th YEAR

WRITE DEPT. 3, ST. LOUIS 20, MISSOURI

THE CURTIS "LUXURY LINE" OF AIR CONDITIONERS COSTS NO MORE

Your ideal source for custom-engineered cranes



Conco 50-Ton CRB Electric Crane used for indoor-outdoor service at Underwriters' Laboratories, Chicago.

CONCO
Overhead Electric Cranes

At Conco you will find the engineering experience and plant flexibility needed to offer your clients true custom-cranes at a practical cost. Conco builds cranes for virtually every class of service, including specialized spark and explosion-proof cranes, circular cranes, indoor-outdoor cranes, and cranes employing closed-circuit TV for remote-control operation. Whatever design assistance you request, including sample specifications for any application, is available here, backed by 35 years experience. May we submit a proposal on your next crane requirement—whether standard or highly specialized.

CRANES HOISTS CONCO

CONCO ENGINEERING WORKS

Division of H. D. Conkey & Company, Mendota 10, Ill.

AFFILIATE: Conco Building Products, Inc. — Brick, Tile, Stone

physics are given. One section on negative temperature systems is basic to recent Maser developments. There is an elementary discussion of stochastic processes and thermal noise, including proofs and applications of the Wiener-Khintchine and the Nyquist theorems. A section on irreversible processes describes the Onsager relations and the principle of minimum entropy production. The principle of detailed balance is explained clearly and applied to nuclear reactions, the compound nucleus, and semiconductors.

The thermodynamics of magnetization, relaxation problems, transport phenomena, magnetoresistance, and the laws of rarefied gases also are treated. There are excellent lists of source references; chief references are grouped together at the beginning of each section to which they apply. Numerous problems of a nontrivial nature permit the reader to develop some of the theory and applications.

The mathematical level rarely goes beyond ordinary calculus, but some parts require a working knowledge of Fourier integrals and a background in classical mechanics, electromagnetism, thermodynamics, and atomic physics. Those parts of analytical and quantum mechanics used most often are reviewed as needed and are not relegated to an appendix. There is a clear section on the density matrix, whose use as a tool in statistical mechanics is growing. Only three sections of the book demand a detailed knowledge of quantum mechanics and are marked as such.

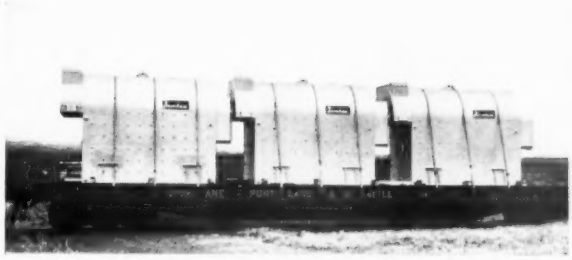
The broad coverage of the book, in spite of its introductory nature, normally would demand a thick volume. Dr. Kittel keeps it down to almost pocket-size by a terse style and by skipping any elaborate discussion of basic concepts. This has much merit; but the beginner is likely to remain confused by such difficult concepts as entropy unless he concurrently reads some book like R. C. Tolman's work on the theoretical foundations. ▲▲

THE BIG ONES COME TO BURNHAM

NASSAU COUNTY OFFICE BUILDING — GARDEN CITY, N. Y.

CHAPMAN, EVANS & DELEHANTY..... *Architects and Engineers — New York City*
V. L. FALOTICO & ASSOCIATES..... *Engineers — Brooklyn, N. Y.*
BERWIND & CO., INC..... *Heating, Ventilating and Air Conditioning Contractors — Garden City South, N. Y.*

BURNHAM'S "COMPACT" STEEL BOILERS HEAT LONG ISLAND'S "OFFICE BUILDING OF THE YEAR"



In shipment, the 3 Compact-Type Boilers, each of 20,000 sq. ft. steam net SBI rating, travel to Nassau County on *one* railroad flatcar. Here's visual evidence of their space-saving compactness.

Considered the largest and finest office building constructed on Long Island, N. Y. in 1958, the ultra-modern Nassau County Office Building uses 3 Burnham Compact-Type Boilers. Proved in 25 years' service, this reliable, highly efficient Burnham design compresses maximum heating capacity into *minimum floor space.* Consider it on your next job where space-saving is important. These welded steel Compact-Type Boilers are available in capacities from 2,600 to 35,000 sq. ft. E.D.R. net steam, SBI, with comparable ratings for water.

Burnham also offers a complete line of *Scotch-Type* and *Scotch-Type Package* Boilers in the above ratings and in certified ratings with up to 4,000 sq. ft. of heating surface.

Burnham Corporation

Steel Boiler Department
Irvington, New York

MEMBER SBI

Sales Representatives throughout the U.S.A.

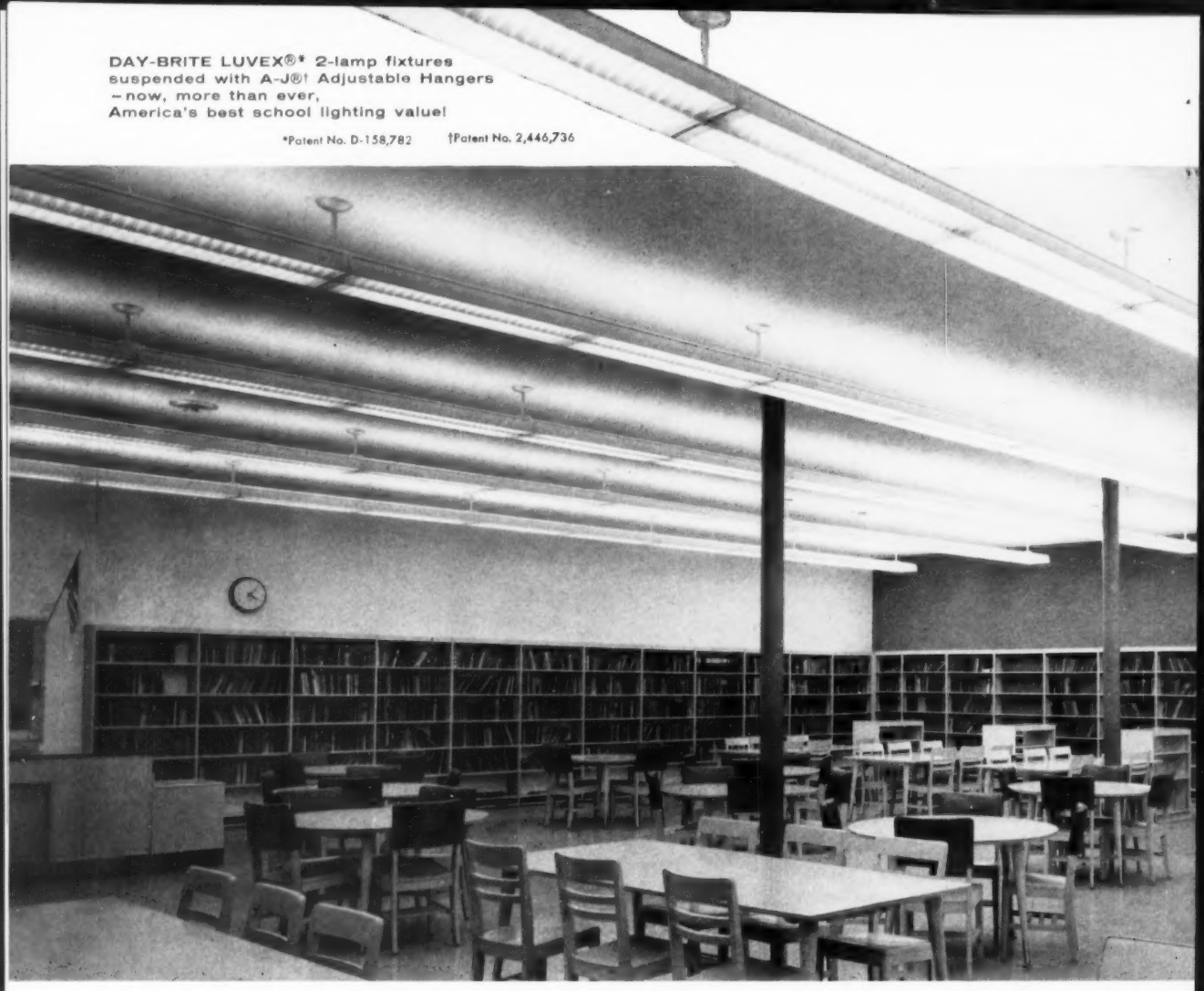
Burnham Corporation CE-39
Steel Boiler Dept.
Irvington, New York

Please send me, without obligation, full ratings and data on:
Compact Boilers ☐ Scotch-Type Boilers ☐ Boiler-Burner Packages ☐

Name .....
Address .....
City ..... State .....

DAY-BRITE LUVEX®* 2-lamp fixtures
suspended with A-J®† Adjustable Hangers
–now, more than ever,
America's best school lighting value!

*Patent No. D-158,782 †Patent No. 2,446,736

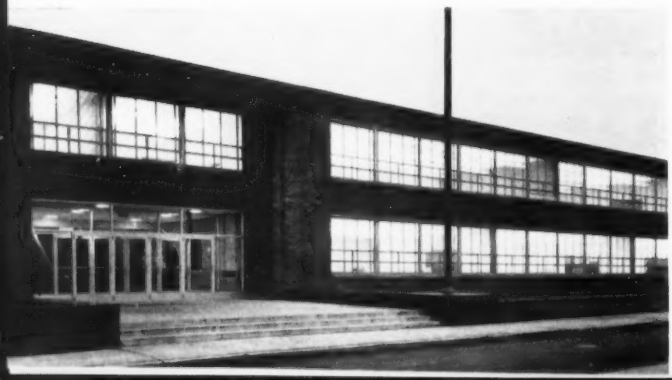


Use Day-Brite Fixtures to get more school lighting jobs

It's easy to see why a Day-Brite lighted school, such as this, usually leads to others. High-level, glare-free Day-Brite lighting in one school sets the standard for *other* schools in a community.

New lower prices on LUVEX make it easier than ever for schools to have Day-Brite lighting . . . particularly when you consider the savings in installation and maintenance costs possible with Day-Brite fixtures.

Plan now to get more school lighting jobs with Day-Brite equipment. Call your Day-Brite representative listed in the Yellow Pages of your phone book.



LINCOLN COMMUNITY HIGH SCHOOL, Lincoln, Illinois
ATKINS, BARROW & ASSOCIATES, Urbana, *Architects*
BROWN, MANTHEI, DAVIS & MULLINS, Champaign, *Consulting Engineers*
BRUNKOW ELECTRIC, Champaign, *Electrical Contractor*

DAY-BRITE ... the Engineer's Choice

Consulting Engineer
R. W. BROWN says:

"Here's how we feel about Day-Brite lighting fixtures"

"It has been our experience that substitutions on our specs lead to headaches and regrets. And this is especially true of lighting fixtures.

"We know that when we specify Day-Brite equipment, we get top efficiency, economical installation and easy maintenance ... in addition to the fine appearance demanded by the architect.

"Perhaps the best example we could offer is that we use Day-Brite fixtures in our own drafting room."

DECIDEDLY BETTER
DAY-BRITE
LIGHTING FIXTURES

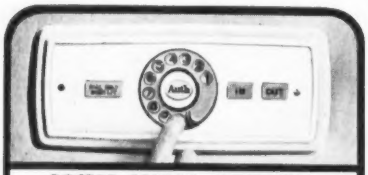
Day-Brite Lighting, Inc.
6256 N. Broadway, St. Louis 15, Mo.
530 Martin Ave., Santa Clara, Calif.

A-92

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

to know
WHO'S
IN . . .
large hospitals
with many doctors
and many entrances
need
Auth
SINCE 1892
"Dial-IN"
Doctors'
IN-OUT Systems

Small Dial-Registers make every entrance a convenient check-in point. Eliminates all space problems, minimizes installation expense, simplifies expansion. Ideal for new or existing hospitals.

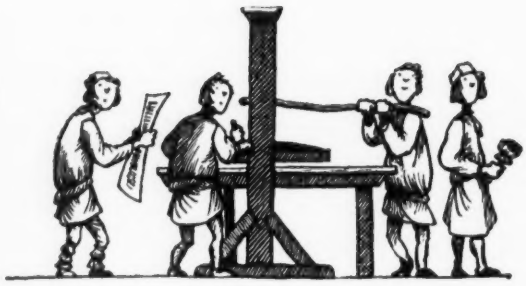


DOCTOR ARRIVES OR LEAVES
Using any convenient entrance, he dials his code number and presses IN or OUT button on small Dial-Register. That's all!

IS DOCTOR IN?
To find out, operator dials his number on small IN-FORMER. Light signal tells her instantly if doctor is in or out.

Auth ELECTRIC CO., Inc.
SINCE 1892
Mail Coupon For Complete Details

AUTH ELECTRIC CO. Inc. Dept. CE-3
Long Island City 1, N. Y.
☐ Please send complete details on the AUTH "Dial-In" System.
☐ Put my name on your mailing list.
Name.....Title.....
Address.....
City.....Zone.....State.....



New Projects Reported

By Consulting Engineers

ALABAMA

Dean Engineering Company
Albany, Georgia
¶ Preliminary survey, water main extensions, new tank, and waterworks improvements. (civil) $80,000. Client, Town of Newton, Alabama.

ARIZONA

Biddle & Young
Phoenix, Arizona
¶ New public library building, Mesa, Arizona. (mech., elec.) Client, Horlbeck & Hickman, Architects.
¶ Electrical transmission line and substation, Yuma. (elec.) Client, Johannessen & Girand, Engineers & Architects.
¶ Flight simulator building, Luke Air Force Base, Glendale, Arizona. (mech., elec.) Client, Charles G. Polacek, Arch.

Holmquist Engineers
Phoenix, Arizona
¶ Sidney P. Osborn Homes, Phoenix, Arizona. Site development and utility plans for 200 low rent housing units. (civil) $160,000. Client, Lescher & Mahoney, supervising architects for Phoenix Housing Authority.
¶ Site development for new supermarket in Phoenix, Arizona. (civil) $200,000. Client, Dunn-Donaldson Construction Co.
¶ Subdivision of approximately 300 acres of rugged forest land near Prescott, Arizona for summer homesites. (civil) $120,000. Client, Floyd Hammon.

CALIFORNIA

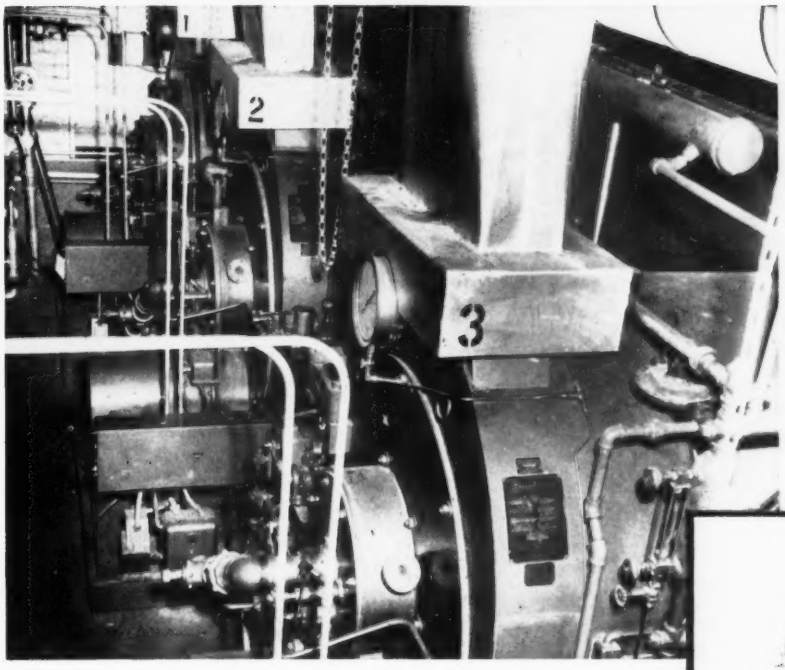
John R. Anderson, Structural Engineer
Pasadena, California
¶ 15,000-sq ft precast concrete tilt-up office building, located in Grand Central Industrial Centre, Glendale, Calif. One-story, composition roof, plywood roof girders with wood framing, steel sash, friction piles for foundation. Leasee, Space Electronics. (struc.) $45,000 (structural only). Client, Grand Central Industrial Centre.
¶ Distribution warehouse at Newport Beach, Calif. 12,000-sq ft building of precast concrete tilt-up construction with wood bowstring trusses, rafters, plywood sheathing, and composition roofing. (civil, struc.) $50,000. Client, United Parcel Service.
¶ 33,500-sq ft tilt-up industrial building with 3500 square feet of office space provided with storage mezzanine above, East Los Angeles, Calif. Leasee, Mohasco Corporation. (civil, struc.) $150,000. Client, Donald F. Shaw, General Contractor.

M. Carleton Yoder
Berkeley, California
¶ Design sewage treatment plant east of Elmira, Calif. for City of Vacaville. Pretreatment facilities designed for average flow of 4.8 mgd and primary facilities designed for 1.2 mgd (stage 1) and a 3-mile trunk sewer. $902,000. Client, City of Vacaville, California.

George S. Erskine, P.E.
Menlo Park, California
¶ School for orthopedic handicapped and cerebral palsied children, San Mateo County, Calif. (mech., elec.) $500,000. Client, County of San Mateo, Calif.

CONNECTICUT

Fred S. Dubin Associates
Hartford, Connecticut
¶ E. C. Goodwin Technical School, New Britain, Conn. (mech., elec.) $3 million. Client, Henry F. Ludorf, Architect.
¶ Jewish community center, Hartford, Conn. (mech., elec.) $1.2 million. Client, The Architects Collaborative.
¶ B'nai Jacob Synagogue, Woodbridge, Conn. (mech., elec.) $1,250,000. Client, Fritz Nathan, Architect.
¶ Mansfield State Training School and hospital power plant repairs, Mansfield,

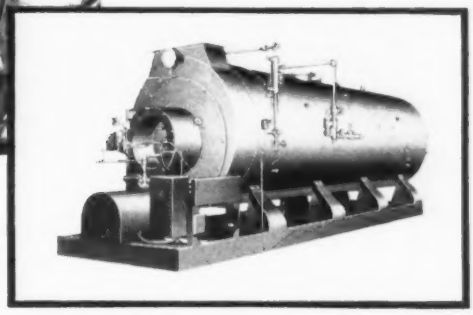


HERCULES-GALION PRODUCTS, Inc., Saves $15,000 Per Year!

Hercules-Galion Products, Inc., of Galion, Ohio, makers of dump truck bodies, ready-mix concrete truck equipment, and steel burial vaults, retired two old style boilers.

To improve heating efficiency, they installed three Cyclotherm 125 h.p. combination light oil/gas package steam generators. The total savings per year comes to $15,000.

As growing production or expanding plant facilities require more steam, Cyclotherms can be added when needed.



CYCLOTHERM

Steam capacity that grows with the plant!

When you recommend Cyclotherm Steam Generators you recommend a steam source that can be quickly and economically expanded to meet plant expansion. For Cyclotherm's wide range of capacities permits the addition of exactly as much new capacity as may be needed at any time. Will 518 lbs. of steam per hr. suit the requirements? That's what a 15 HP Cyclotherm produces. Or are 25,875 more steam lbs. per hour wanted? In that case, a 750 HP Cyclotherm fills the bill. And between these extremes there are sixteen intermediate sizes to choose from.

Compact Cyclotherms are also kind to boiler room space – the Cyclotherm is up to ⅓ smaller than the ordinary package boiler. Installation is easy—no costly stack, no excavation, no foundation. The Cyclotherm is shipped complete – ready to operate. Burner and boiler are built together to work together with *one* manufacturing responsibility back of the entire unit.

Cyclotherm's Cyclonic Combustion guarantees a minimum of 80% efficiency. Larger units operate at from 30% to 100% of rated capacity with no loss of efficiency. Smaller units operate on and off automatically according to load requirements. With simpler design and fewer parts, Cyclotherm reduces maintenance costs by from 30% to 50%. Cyclotherm's world-wide service organization gives prompt service on every call. For full information, write us today.

There are 18 Cyclotherm models, ranging from 15 HP to 750 HP. Burns oil and/or gas. The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters' Laboratories, Inc. Guaranteed against any defect in materials or workmanship. Cyclotherm also manufactures a complete line of Hot Water Generators in 10 capacities, from 670,000 BTU per hr. to 6,700,000 BTU per hr.

YEARS AHEAD IN STEAM & HOT WATER GENERATION

CYCLOTHERM®

STEAM AND HOT WATER GENERATORS

A Division of National-U.S. Radiator Corp., Oswego, N.Y.

Clip to Your Letterhead

Cyclotherm Division
National-U.S. Radiator Corp.
57 E. First St., Oswego, N. Y.

Please send me your booklet *Cyclotherm Cyclonic Combustion*, also rotogravure copy of *Cyclotherm Sales Steam* with illustrations and descriptions of Cyclotherm installations.

*BARNEBEY'S NEW ECLECTIC READER**

LESSON I.

ăn'gẽr	cās'tle	rē cir'cu lā'tion
dĭs māy'	hēat'ĭng	cōde
mĭm'ĭc	100%	out'sīde'

THE UNHAPPY ENGINEER

1. "O pussy!" cried Herbert, in a voice of anger and dismay, as his mimic castle fell in sudden ruin, when the playful cat knocked over the blocks.

2. He threw one of the blocks fiercely at pussy. Hettie caught up the cat. "No, no, no!" said she, "you sha'n't hurt pussy."

3. Herbert began to cry. "It had such a fine heating system," he exclaimed.

4. "Did you use Barnebey-Cheney activated charcoal filters to permit 100% recirculation of inside air?" asked Hettie.

5. "But the codes specify 40% outside air," he said.

6. "Don't be old fashioned," said Hettie. "Air that's been purified by activated charcoal is the equivalent of outside air and that's how you cut the heating bills and meet the code, too."

Write for bulletin 591 on purifying recirculated air to Barnebey-Cheney Company, Columbus 19, Ohio

Barnebey Cheney

*We gratefully acknowledge American Book Company's permission to use the illustration, and tip our hats to McGuffey whose First Reader is more than 100 years old.

Conn. (struc., mech., elec.) $70,000. Client, State of Connecticut Public Works Department.

¶ Connecticut State Medium Security Prison, Enfield, Conn. (mech., elec.) $12.5 million. Client, LaPierre, Litchfield & Partners and Alfred Hopkins & Associates.

¶ West Hartford Methodist Church and school, West Hartford, Conn. (mech., elec.) $150,000. Client, George C. Kibbe, Architect.

¶ Gaylord Farms Sanitorium, Wallingford, Conn. (mech., elec.) $1 million. Client, James H. Ritchie Associates, Architects.

¶ Rehabilitation of Charter Oak, Elmwood & Morley elementary schools, West Hartford, Conn. (mech., elec.) $200,000. Client, Town of West Hartford.

Morton S. Fine
Hartford, Connecticut

¶ Apartment house project, East Hartford, Conn. (civil) $600,000. Client, Kane & Fairchild, Architects.

DELAWARE

Daniel Koffler & Associates
New Castle, Delaware

¶ St. Elizabeth's Convent, Wilmington, Delaware. Steel and concrete framed complex including bedroom wing, dining hall, community building, and chapel. (struc.) $300,000. Client, Howard Greenhouse & Associates, Architect.

¶ Addition to fabricating plant, 60 feet x 85 feet, steel frame of tapered girders and masonry walls. (civil, struc., mech., elec.) $30,000. Client, H & S Mfg. Co., Ashley, Delaware.

¶ 60-ft steel tower to carry two 3000-lb electric signs, Wilmington, Delaware. (struc.) $7000. Client, Tupp Sign Co., Wilmington, Delaware.

¶ Alteration and conversion of structure to office building, including excavation, underpinning of building for parking, air conditioning system, new plumbing, and some demolition, Wilmington, Delaware. (civil, struc., mech., elec.) $25,000. Client, Wilmington Real Estate & Finance Corp., Wilmington, Delaware.

¶ Two-story medical building, Newark, Delaware. (struc.) $60,000. Client, Howard Greenhouse & Associates, Architects.

¶ Home Life Insurance Co., Minquadale, Delaware. Supervision of construction. $35,000. Client, Richard I. Rubin, Philadelphia, Pa.

¶ New sanitary and storm sewer system. (civil) $50,000. Client, Street & Sewer Department, Wilmington, Del.

¶ Cavaliers Country Club consisting of two floors, ballroom, dining room, locker rooms, and lounges; steel frame and concrete floors; New Castle, Delaware. (struc.) $250,000. Client, Howard Greenhouse & Associates, Architects.

DISTRICT OF COLUMBIA

Andre Merle Associates
Washington, D. C.

¶ Modernization of 30-unit apartment building, all trades, including future air conditioning and electrical facilities,

for effective liquid transfer

For effective liquid transfer there are several methods. But for moving water in volume, a most efficient, dependable and truly economical means is the Peerless Hydro-Foil pump. In all the big jobs: municipal or industrial water supply, condenser cooling service in steam plants, river and canal diversion, flood control – Peerless Hydro-Foil is the leader. It has outstanding head-capacity characteristics, it's available in mixed and axial flow types, it performs equally well in continuous or intermittent duty. With capacities from 600 gpm to 300 mgd and with head ranges to 60 ft., the Peerless Hydro-Foil is "the big pump for the big jobs."

WRITE FOR ILLUSTRATED BULLETIN No. B-148

PEERLESS PUMPS

Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

FOOD MACHINERY AND CHEMICAL CORPORATION

Peerless Pump Division

Plants: LOS ANGELES 31, CALIFORNIA and INDIANAPOLIS 8, INDIANA

Offices: New York; Cleveland; Chicago; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno. **Distributors in Principal Cities.** Consult your telephone directory.

Here's why more and more waterworks men are specifying

Sparling meters...

Sparling propeller meters are accurate, maintenance free and last for years

There are reasons for the increasing use of Sparling Propeller Meters. The main reason is that *totalization is Sparling's primary step* . . . after all, the usual purpose of metering is to determine the total amount of water. Rate indication and recording is Sparling's *secondary step.* Furthermore, with Sparling's free-flow design there is practically *no pressure loss,* an important economic consideration in flow measurement. Sparling meters are guaranteed accurate within 2% when properly installed. Finally, Sparling meters enjoy long life, free of any real problems of wear, incrustation, and corrosion, Recently, a 4-inch meter was "opened" for routine inspection, after 20 years of accurate service, and it showed no wear affecting accuracy. Start towards good metering now, write today.

Write for this informative brochure on the Sparling Line of Water Metering and Control Equipment. No obligation. Sparling Meter Company, 225 North Temple City Boulevard, El Monte, California.

Dept. CE

Sparling meters

Other Sparling Offices: ATLANTA 3 • CHICAGO 4 • CINCINNATI 2 • DALLAS 1, TEXAS • DENVER 6 KANSAS CITY 6, MO. • ROSELLE, N. J. • SAN FRANCISCO 24 • SEATTLE 99 • TORONTO, CAN. • ROMFORD, ENG.

Washington, D. C. $345,000. Client, Jach Bindeman Associates.
¶ 8-story office building, complete air conditioning, electrical, and new elevators, Washington, D. C. $500,000. Client, Shannon & Luchs.
¶ All mechanical and electrical services for two 24-unit apartment buildings in Washington, D. C. $350,000 each. Client, Hedin Construction Company.

Herbert Manuccia, P.E. and Associates
Washington, D. C.
¶ Installation of six stories of escalators and interior alterations. (civil, struc., mech., elec.) $650,000. Client, Lansburgh's Dept. Store, Washington, D. C.

FLORIDA

Greenlees, Arbogast & Associates, Inc.
Stuart, Florida
¶ Engineering design of subdivision development. $25,000. Client, L & R Builders, Miami, Florida.
¶ Engineering design of subdivision development. $30,000. Client, Elda Corp., Stuart, Florida.
¶ Preliminary sewage and storm drainage master plan. Client, Stuart, Florida.

J. B. Ford Company
Fort Myers, Florida
¶ Land development, roads, water system, seawalls, excavation. West of City of Punta Gorda, Fla. (civil) $1.5 million. Client, Punta Gorda Isles, Inc.

Maurice L. Eisenberg
Miami, Florida
¶ Synagogue, $110,000, Hebrew school, $80,000, Greynolds Park, Florida. (struc.) Client, Adath Yeshuran Congregation.

De Leuw, Cather & Brill
New York, New York
¶ Miami, Florida 36th Street interchange. (civil) $8 million. Client, Florida State Highway Department.

Arthur L. Bromley, Structural Engineer
Fort Lauderdale, Florida
¶ Main fire station for City of Hollywood, Florida. Complete modern facilities, including kitchen, workshop, chief's offices, hose storage and drying, pull box panel, and quarters for officers and men. (struc.) $100,000. Clients, City of Hollywood, Fla. and Marvin Hahn, Architect.

GEORGIA

J. Arthur Maddox
Savannah, Georgia
¶ Westside shopping center, Savannah. (elec.) $150,000. Client, D. J. Morrison.

Tribble & Associates
Macon, Georgia
¶ Sewage collection system and treatment plant including two lift stations, preliminary. (civil, mech., elec.) $290,000. Client, City of Soperton, Georgia.
¶ Sewage treatment plant including lift station, primary settling tank, sludge pumps, digester, high rate filter, final set-

Wherever the four winds blow...
this trademark stands for

matchless power exhauster performance

Here's why . . .

Jenn-Air developed the first spun aluminum, low contour exhauster years ago. This was a milestone in exhauster design, but it was by no means Jenn-Air's last word on the subject. Product improvement is a never-ending project at Jenn-Air, and this emphasis on engineering has netted rich dividends over the years. Examples of exclusive features developed by Jenn-Air include:

• **U-spring suspension**—Compensates for both radial and lateral movement to reduce vibration and noise. 44% more effective than rubber isolaters. Unconditionally guaranteed for life!

• **Integral balance**—In addition to dynamic and static balancing of blades, Jenn-Air exhausters feature *integral* balancing of blade with motor. This is an important contribution toward further noise reduction.

• **High point of discharge**—Motor is nested in the housing to provide the highest discharge point of any roof exhauster. By eliminating the need for a high curb base, this feature also makes possible Jenn-Air's attractive "low contour" design.

Every Jenn-Air exhauster that comes off the production line is individually tested for sound level, motor load and insulation breakdown. Only units which can pass these rigid tests are accepted for shipment. Air moving capacities range from 175 to 22,700 cfm and are AMCA-certified. Write for Bulletin 58-B.

JENN-AIR

Jenn-Air Products Co., Inc
1102 Stadium Drive
Indianapolis 7, Indiana

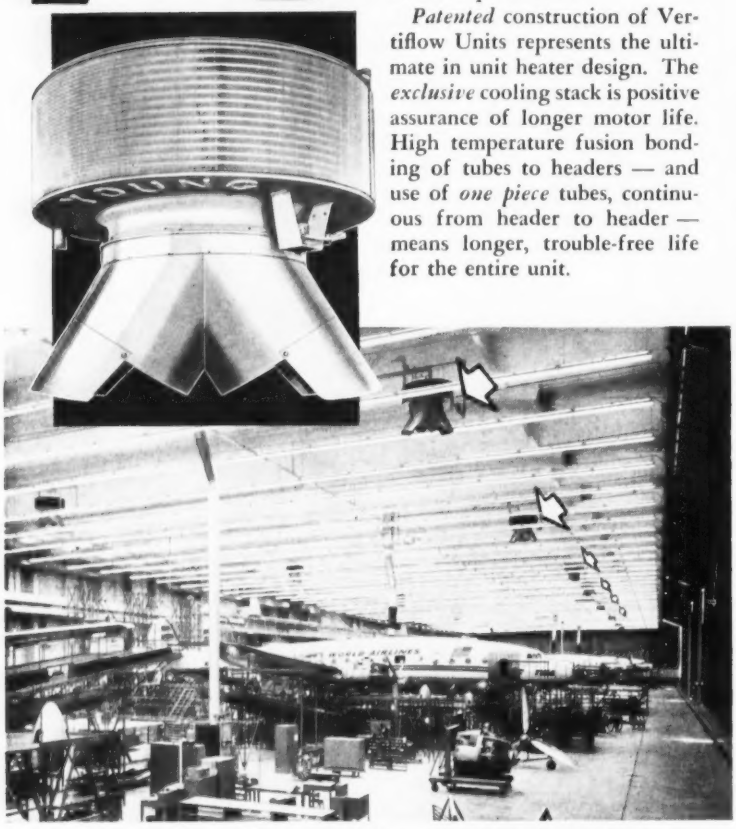
Member of Air Moving and Conditioning Association

This may be the answer to your heating problem!

VERTIFLOW®
UNIT HEATERS
by Young

Vertiflow Unit Heaters are *specifically designed* for heating areas with high ceilings, or where large "clear span" areas are required. Twenty-two sizes, and a selection of six different types of diffusers assure a choice to meet the specific need — according to the capacity and blow-down requirements.

Patented construction of Vertiflow Units represents the ultimate in unit heater design. The *exclusive* cooling stack is positive assurance of longer motor life. High temperature fusion bonding of tubes to headers — and use of *one piece* tubes, continuous from header to header — means longer, trouble-free life for the entire unit.



Giant Overhaul Hangar Utilizes 36 Vertiflow Unit Heaters by Young to Warm 18,480,000 Cubic Feet

This giant TWA Overhaul Hangar at Kansas City, Mo. has two interior areas, each 160′ x 818′ free from any obstruction (made possible by the shell and cable design of the roof), and is capable of servicing 10 Lockheed Super Constellations at one time. Vertiflow Heaters, with Dual Jet Revolving Diffusers, are suspended 45 feet above the floor . . . providing an adequate flow of warmed air to all areas.

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

Write Dept. 499-C for Catalog 2659

tling tank, sludge drying beds. (civil, mech., elec.) $150,000. Client, City of Blackshear, Georgia.
¶ Propane peak shaving plant. (civil, mech., elec.) $102,000. Client, City of Albany, Georgia.
¶ Sewage collection system. Northwoods subdivision. (civil) $17,000. Client, Murphey, Taylor & Ellis, Macon, Georgia.

Dean Engineering Company
Albany, Georgia
¶ Preliminary survey, sewer main extensions, sanitary sewer interceptor system, and disposal plant. (civil) $325,000. Client, City of Vienna, Georgia.

Walter H. West & Associates
Atlanta, Georgia
¶ 220-unit motel, Jekyll Island, Georgia. (struc., mech., elec.) $352,000. Client, Mastin & Summer, Arch., Atlanta, Ga.

ILLINOIS

Neiler, Rich & Bladen
Chicago, Illinois
¶ Complete new 220,000 lb per hr boiler plant and steam distribution tunnels to serve Northwestern University's Chicago campus as well as Chicago Wesley Memorial Hospital, Passavant Hospital, and the American Hospital Association's new headquarters building. All operations involved in unloading of coal and removal of ashes carried on indoors. (civil, mech., elec.) $1,275,000. Client, Northwestern University.

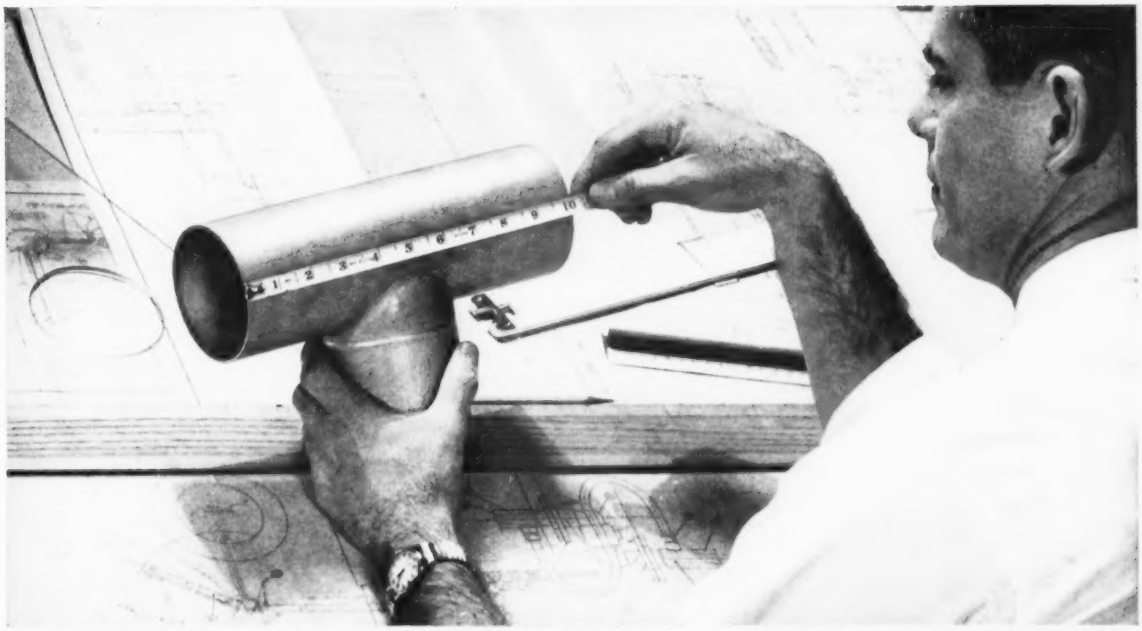
Fred S. Dubin Associates
Hartford, Connecticut
¶ Town houses, Hyde Park, Chicago, Ill. redevelopment. (mech., elec.) $8 million. Client, I. M. Pei, Webb & Knapp Company.

KANSAS

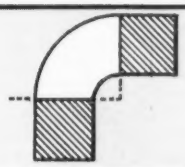
Evans & Bierly
Great Bend, Kansas
¶ Streets, soil cement paving with double seal curb and gutter, drainage. (civil) $140,000. Client, City of Oberlin, Kansas.
¶ Streets, soil cement paving with double seal curb and gutter, drainage. (civil) $70,000. Client, City of Osborne, Kansas.
¶ Sewage treatment plant, relief mains, including two-stage digestion, primary and secondary clarifiers, trickling filters. (civil) $250,000. Client, City of Ellinwood, Kansas.
¶ Streets, soil cement paving with curb and gutter, drainage. (civil) $180,000. Client, City of St. John, Kansas.

MAINE

Fred S. Dubin Associates
Hartford, Connecticut
¶ Presque Isle AFB housing, Presque Isle, Maine. (mech., elec.) Client, Alonzo J. Harriman, Architect.
¶ Loring AFB Wherry housing, Limestone, Maine. (mech., elec.) $2,967,000. Client, Alonzo J. Harriman, Architect.
¶ Topsham AFB dormitory and mess buildings, Topsham, Maine. (mech., elec.)



SAVINGS ARE MEASURABLE...START TO FINISH WITH *LONGER LENGTH* SPEEDLINE FITTINGS



HERE'S HOW YOU CAN CUT PIPING COSTS

A conventional 90° elbow is shown inside the dotted line. The shaded areas indicate the extra length you get with a Speedline fitting—at no extra cost. For example, on a 3" Speedline Elbow it means 4" more pipe. Thanks to the longer length of all Speedline fittings, all types of joints are made more easily . . . cost less . . . than with conventional fittings. Make your own comparisons.

For location of Authorized Distributor nearest you, see Speedline listing on page 593 in Chemical Engineering Catalog.

With this 3" Speedline Tee you get 3¼" "*more length*" at no extra cost. Speedline's *tangential feature* cuts costs and design detailing, too . . . lets you select the best joint to meet assembly requirements . . . means more clearance for welding and easier pipe aligning. Flange where you want to, weld where you want to . . . *any* type joint can be used on *any* or *all* ends of a Speedline corrosion resistant fitting!

Greater flexibility of Speedline long length fittings adds up to faster assembly and *lower installed costs*—even for the most complex process piping system. And, of course, Speedline corrosion resistant fittings *cut material costs two ways:* they give *more* pipe length per fitting and they facilitate use of economical *light wall stainless* steel pipe.

Before you plan any new installation or system addition, investigate the many advantages of Speedline's *tangential* feature. Write for Speedline Catalog showing how you save with the complete line of Speedline fittings.

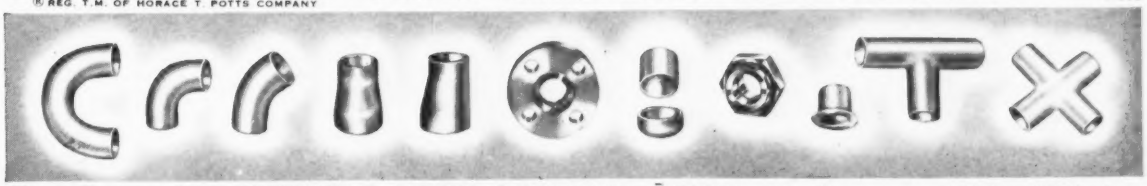
Speedline®

® REG. T.M. OF HORACE T. POTTS COMPANY

STAINLESS STEEL FITTINGS

SPECIALLY DESIGNED FOR SCHEDULES 5 AND 10 PIPE

P-506

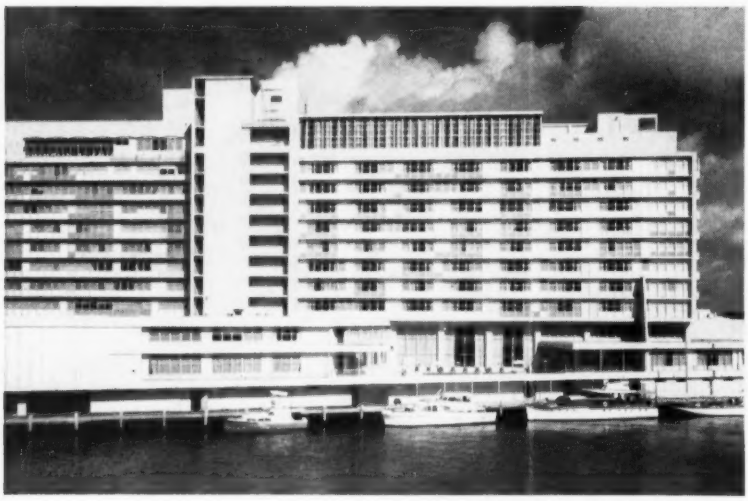


Manufactured by HORACE T. POTTS COMPANY • 522 E. Erie Avenue • Phila. (34), Pa.

STROMBERG-CARLSON

congratulates...

DUPONT PLAZA CENTER · MIAMI, FLORIDA



Architects: Frank H. Shuflin & Assoc.
Consulting Engineer: J. E. Curley & Assoc.

A prize-winning architectural achievement, the Dupont Plaza Center in downtown Miami is designed for the merchandising of building products and related items.

The triple-service structure—the first of its kind in the world—marks a new, practical integration of display area, office space and hotel facilities. And a Stromberg-Carlson integrated sound system was selected to provide the utmost in complete, modern communications for the entire center. The installation includes:

- **Five-channel radio system, with one channel available for an outside music source.**
- **Two-channel music system for the hotel to deliver music—or music and paging—to any individual area.**
- **Maid's call for selective location of maids.**
- **Complete sound system for the architects' sample bureau.**
- **Large number of selector stations which permit selection of the 11 programs going on for distribution to any point.**
- **Latest master antenna equipment, closed circuit systems, large projection TV sets, and intercom facilities between message centers.**

The Stromberg-Carlson system doing this big job was "custom-engineered" from standard components. This efficient, economical arrangement is available to meet your needs in all types of construction.

Our field engineers are available for consultation on your current and future projects. Our factory-trained distributing organization is ready to handle all installation and maintenance problems.

How can we serve you?

"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON
A DIVISION OF GENERAL DYNAMICS CORPORATION
SPECIAL PRODUCTS DIVISION • ELECTRONICS CENTER
1440 N. Goodman Street, Rochester 3, New York

S-C | GD

Electronic and communication products for home, industry and defense . . . including High Fidelity Consoles; School, Sound, Intercom and Public Address Systems

$100,000. Client, A. J. Harriman, Arch.
¶ Hardwood products plant, Guilford, Maine. (mech., elec.) $800,000. Client, Alonzo J. Harriman, Architect.

MARYLAND

Andre Merle Associates
Washington, D. C.
¶ 200-unit modern air conditioned apartment building with garage, swimming pool, Baltimore, Maryland. $3 million. Client, Harry Kessler, Architect, builder.

Eugene J. Aufiero
Harrisburg, Pennsylvania
¶ Carroll County General Hospital, Westminster, Maryland. (struc.) $1 million. Client, Starr & Long, Architects.

MASSACHUSETTS

Fred S. Dubin Associates
Hartford, Connecticut
¶ Osgood Street and Hamlet Street Schools, Lawrence, Mass. (mech., elec.) $1.5 million. Client, Warren H. Ashley, Architect.

MICHIGAN

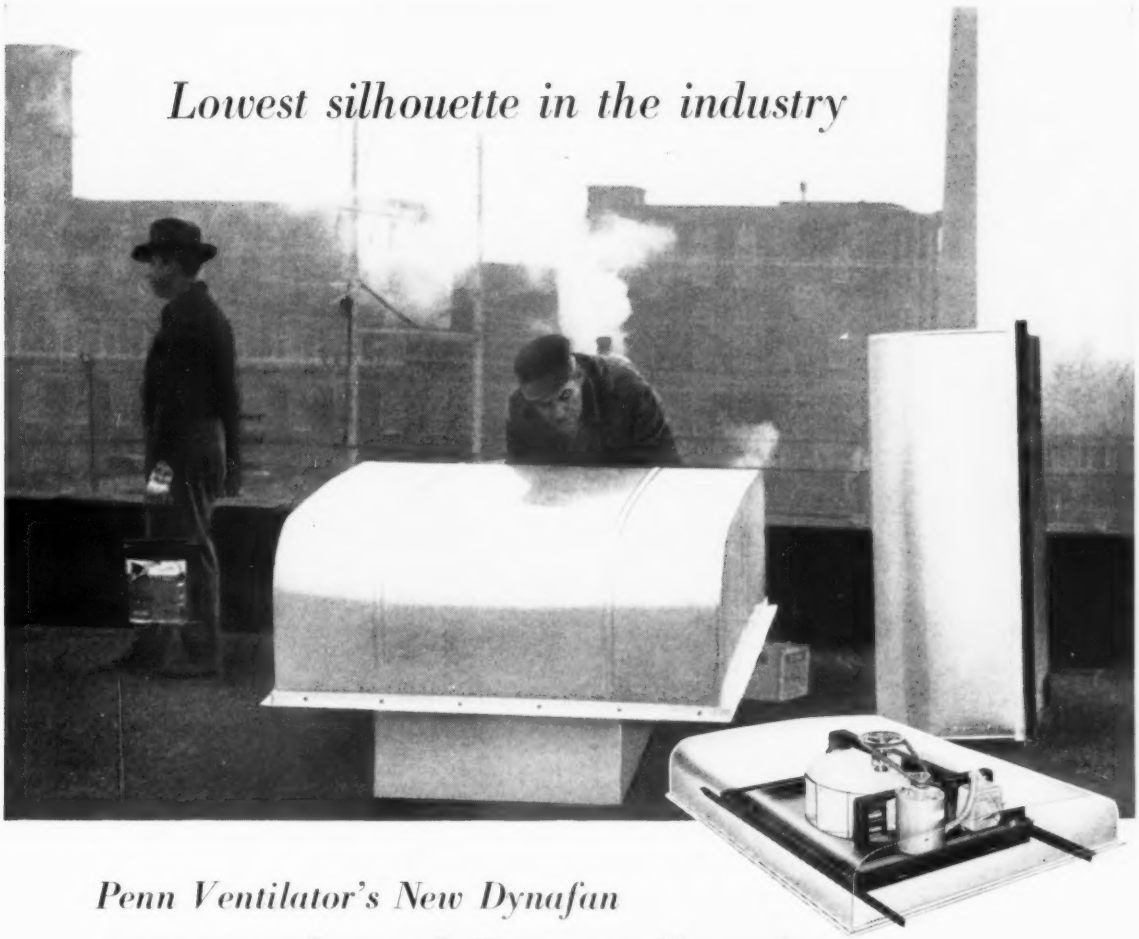
McNamee, Porter & Seeley
Ann Arbor, Michigan
¶ Improvements to water treatment plant and pumping station, including new 12,000-gpm high service pump, new lime feeders and slakers, new piping connection to permit split treatment, new drive units on coagulation tank paddlers, receiving basin for wash water and provision to return same to raw water inlet for retreatment, sludge collectors for settling tanks, and sludge pumps. $210,000. Client, City of Saginaw, Michigan.

MISSOURI

Fred S. Dubin Associates
Hartford, Connecticut
¶ Federal office building, St. Louis, Mo. (mech., elec.) $10 million. Clients, Murphy & Mackey, Architects and William B. Ittner, Inc.
¶ Redevelopment housing, St. Louis, Mo. (mech., elec.) $12 million. Client, Murphy & Mackey, Architects.
¶ Stephens College dormitories, Columbia, Mo. (mech., elec.) $1.5 million. Client, Murphy & Mackey, Architects.

MONTANA

T. T. Heberly, Electrical Engineer
Havre, Montana
¶ 65 miles of 69-kv transmission line and two substations. (elec.) $350,000. Client, Hill County Electric Cooperative, Havre, Montana.
¶ 12 miles of 69-kv transmission line and one substation. (elec.) $100,000. Client, Sun River Electric Cooperative, Fairfield, Montana.
¶ System study. (elec.) Client, Sun River Electric Cooperative, Fairfield, Montana.
¶ Design and construction of approximately 600 miles of rural telephone line



Penn Ventilator's New Dynafan

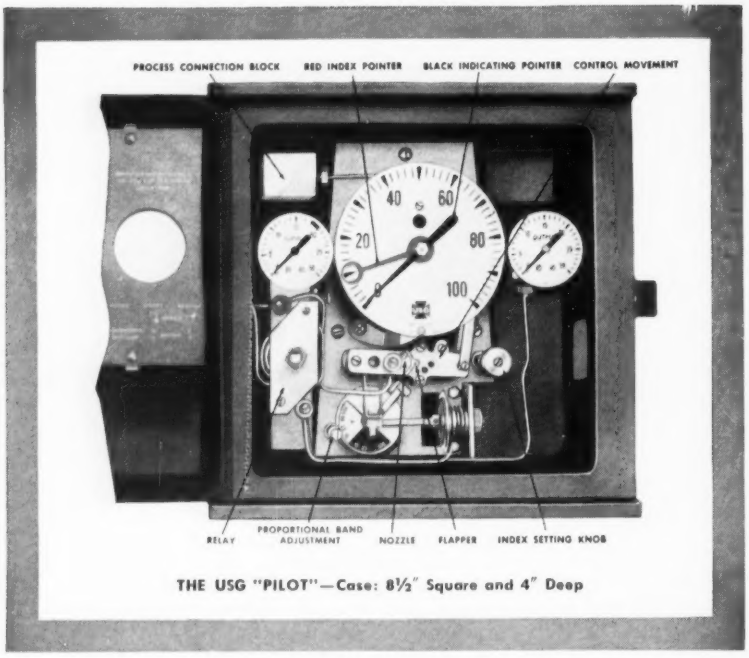
Lowered and Streamlined!

Low-Contour Dynafan. That's the name we've given to our new roof exhauster. It cuts almost 50% off normal roof exhauster heights . . . and its lines are cleaner, more modern. The Low-Contour Dynafan is the safest insurance that clean lines designed into modern buildings will not be compromised. And for more uniform appearance, the same modern housing is available for use as supply and relief units.

The new Low-Contour Dynafan is more than just low and clean-lined. Major engineering advances are incorporated . . . for example, you won't find the motor atop the wheel as with other roof exhausters, and you won't find the vibration-prone overhung shaft, either. Instead, noise has been cut appreciably by straddling . . . now the fan wheels are supported between sealed ball bearings located above and below the wheels. And the entire fan unit floats on vibra-sorb vibration eliminators. In addition, exact type motors to fit your particular service condition are supplied.

Get all the details on Penn Ventilator's new Low-Contour Dynafan. Call your local Penn Ventilator representative, or write to Penn Ventilator Co., Philadelphia 40, Pa.

PENN VENTILATOR CO., INC.
GOODMAN & ALLEGHENY, Philadelphia 40, Pa.
Representatives and Distributors in Principal Cities
Charter member of AMCA



THE USG "PILOT"—Case: 8½" Square and 4" Deep

A COMPACT, LOW-COST* INDICATING PNEUMATIC CONTROLLER

for pressure . . . temperature . . . other variables

(1) Control modes to suit your process: Two-position with differential gap (1 to 100%) . . . proportional (1 to 150%), alone or with automatic reset or rate action. Control mode or control action (direct or reverse) easily altered in field.

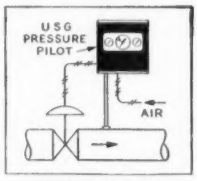
(2) Variable and set point both indicated on large dial: Black pointer indicates reading on 3½-inch dial (6¼-inch scale length). Red circle-tipped pointer spots location of set point.

(3) High accuracy and sensitivity at low cost: Accuracy of 1% of range over middle half of scale. Sensitivity less than 0.1% of scale at 100% proportional band setting . . . compares favorably with higher-priced controllers.

(4) Simplified maintenance and repair: Precalibrated measuring element can be removed for range change. Other basic components, even entire control chassis, can be removed for easy maintenance.

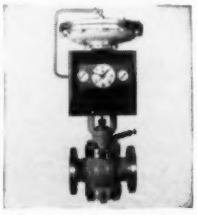
(5) Controls a broad range of variables: Pressures from 30" Hg vacuum to 10,000 psi. Temperatures from —350 F to + 1000 F. Can be adapted to control many other variables, including liquid level.

**Sample price: $126.00 for unit with 316 S.S. Bourdon tube, range 0-600 psi, proportional control 1-100%.*



Typical pressure reducing service

Can be panel or surface mounted



Can be valve mounted

Find Your Nearest Distributor In The 'Yellow Pages'

Write for Catalog 510 . . . Gives complete specifications and description of the USG Pilot as well as pneumatic transmitters and receivers for process instrumentation. Send for your copy today, or contact your nearest USG distributor.

UNITED STATES GAUGE
DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

USG

involving four automatic dial exchanges. (elec.) Client, Triangle Telephone Assoc., Havre, Montana.

NEW HAMPSHIRE

Thomas W. Reed
Pittsford, Vermont
¶ Orford high school, Orford, N. H., including classroom, kitchen, gym, and showers. (elec.) $5000. Client, Helmer & Cole, Architects, Woodstock, Vt.

NEW JERSEY

H. G. Metzger Jr. & Associates
Huntingdon Valley, Pennsylvania
¶ Motor hotel renovation, Camden, New Jersey. Plumbing and drainage. (mech.) $200,000 (total). Client, Martin Guttman, Architect.

Kelly & Morris
Jersey City, New Jersey
¶ Hudson County Boulevard rehabilitation, street lighting, traffic signals. (elec.) $1.5 million (elec.); $10 million (total project). Client, Thourot & LaMort, Consulting Engineers.

Fred S. Dubin Associates
Hartford, Connecticut
¶ Douglas College Library, Rutgers University, New Brunswick, New Jersey. (civil, struc., mech., elec.) $1 million. Client, Warner, Burns, Toan & Lunde, Arch.
¶ South Brunswick high school, South Brunswick, New Jersey. (civil, struc., mech., elec.) $1.5 million. Client, Alexander Merchant Associates, Architects.

NEW YORK

Henry J. Campbell, Jr.
Mineola, New York
¶ Lafayette Presbyterian Church, Brooklyn, New York. Studies for modernization of heating, ventilating, and electrical systems including alterations to existing buildings. (mech., elec.) Client, Merrill & Holmgren, Architects.
¶ KLM departure wing, Idlewild Airport, New York. Alterations to heating, ventilating, and electrical systems. (mech., elec.) Client, Raymond & Rado, Arch.
¶ Filtor's, Inc., Manhasset, New York. Heating and air conditioning for industrial spaces. (mech.) Client, Henry Titus Aspinwall, Architect.
¶ Queens-Nassau Transit Lines, Inc., Flushing, New York. Alterations to existing heating and air conditioning systems including revisions of new automatic control system. (mech.) Client, Queens-Nassau Transit Lines, Inc.

Charles W. Personius, P.E.
Pine City, New York
¶ Broadway elementary and junior high school, Elmira, New York. 56 classrooms, gymnasium, auditorium, playroom-dining areas. (mech., elec.) $2.3 million. Client, Considine & Haskell, Architects.
¶ St. Joseph's Hospital, Elmira, New York. Alterations to existing building including new electrical services and dis-

Question:

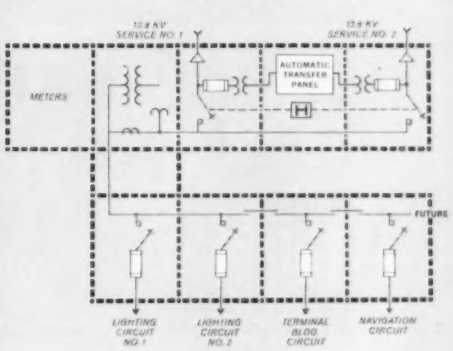
Why did Greater Cincinnati Airport use S&C Metalclad Switchgear in its high-voltage power system?

Answer:

There was *only one answer* to the requirements of maximum reliability, continuity of service, adequate short circuit protection, and full load switching, all at low cost —S&C Fused Load Interrupter Metalclad Switchgear.

Q: Why are power fuses and load interrupters used to replace circuit breakers in this type of switchgear?

A: Because conductors in such installations as this modern airport run in protected underground conduit and tunnels, and are not subject to transient faults caused by trees, wind, or rodents; protection against permanent faults is the only kind needed—and this is provided by S&C Power Fuses.



Q: How is automatic preferred-to-emergency transfer for service continuity provided in this S&C Metalclad Switchgear equipment?

A: By means of an S&C Standard Automatic Transfer Panel used with Moto-Draulic operator, a variety of throwover schemes is available at the flip of a switch. This transfer panel provides for making either source preferred; choice of automatic or manual return; choice of time delay (up to 10 minutes); and optional manual operation of line switches.

Q: Why can S&C offer savings up to 50% in this modern switchgear and still meet the highest standards of quality?

A: Because of the inherent simplicity of the S&C Fused Load Interrupter (compared to complex circuit breaker equipment), savings of 50% and more in the initial cost of switchgear equipment can be realized while the highest quality standards are maintained for the installation.

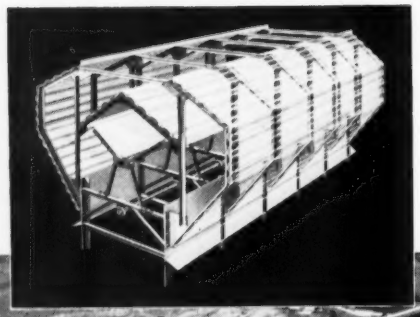
Q: How can you get information about such switchgear?

A: From S&C sales offices in principal cities. Consult your telephone directory.

S&C ELECTRIC COMPANY
4436 Ravenswood Ave., Chicago 40, Ill.

Specialists in High-Voltage Circuit Interruption for Electric Utilities Since 1910

Burt Monovent Continuous Ridge Ventilator converts roof ridge to a quick-acting, giant air valve . . . economically



POT ROOM AIR MOVES OUT FAST AT REYNOLDS ALUMINUM

The huge new Reynolds Metals Company's aluminum plant at Sheffield, Alabama, conditions the air in each manufacturing operation with a carefully engineered system of modern Burt Ventilators.

On the pot lines, where the snow-white alumina powder is transformed into aluminum in bath of molten cryolite — where great crucibles of molten metal swing down the aisles — 84" aluminum Burt Monovents keep the air moving out fast. Over 7,200 lineal feet of this continuous ridge type Burt ventilator — more than 1⅓ miles — ventilates the nine pot line buildings uniformly and economically. Nearly 400 lineal feet of 60" Burt Monovent conditions the service building.

Atop the adjoining rectifier building, with its thousands of square feet of electrical equipment, twenty five 54" aluminum Burt Free Flow Fan and Gravity ventilators provide fast, big-volume exhaust.

Thirty additional aluminum Burt Free Flow Gravity ventilators serve the pin cleaning, coke and ore unloading and carbon paste buildings.

In the big Reynolds installation only two Burt ventilator types were required. Other types and sizes might better solve your air moving needs. You will find them all readily available in the complete line of time-proven, modern Burt Ventilators.

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-101-G. It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS · LOUVERS · SHEET METAL SPECIALTIES

The Burt Manufacturing Company

919 S. High Street Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

tribution, new operating suite, two-story addition, new kitchen facilities. (mech., elec.) $1 million. Client, Considine & Haskell, Architects.

¶ Alterations and addition to Schuyler County Hospital, Montour Falls, New York. (mech., elec.) $200,000. Client, Considine & Haskell, Architects.

¶ Oswego Museum, Oswego, New York. New historical building. (mech., elec.) $200,000. Client, Robert T. Bickford, Architect.

¶ Pine City elementary school, Pine City, New York. 13 classrooms and gymnasium building. (mech., elec.) $700,000. Client, Robert T. Bickford, Arch.

Charles H. Pratt
Syracuse, New York

¶ Lateral extensions to newly completed Split Rock Water District, Town of Onondaga, New York, (civil) $115,000. Client, Town of Onondaga, New York.

¶ Split Rock Gulf Water District. Modernization and replacement of existing water supply system. (civil) $100,000. Client, Town of Onondaga, New York.

Melvin H. Friedman & Associates
Bergenfield, New Jersey

¶ New bank building, Red Hook, New York. Baseboard hot water heating, forced air duct cooling, luminous ceiling, and recessed lighting. (mech., elec.) $100,000. Client, Schofield & Colgan, Arch.

NORTH CAROLINA

L. E. Wooten and Company
Raleigh, North Carolina

¶ Secondary type, sewage treatment plant, Henderson, North Carolina. (civil) $600,000. Client, Henderson, N. C.

¶ Secondary type, sewage treatment plant, Tarboro, North Carolina. (civil) $600,000. Client, Town of Tarboro, N. C.

¶ 110-kv substation, La Grange, North Carolina. (elec.) $130,000. Client, Tri County Electric Membership Cooperative, Goldsboro, N. C.

OHIO

Emmet J. McDonald & Associates
Akron, Ohio

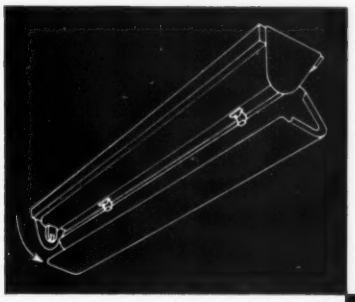
¶ Water supply system for small subdivision in Green Township, Summit County, Ohio. (civil) $20,000. Client, J. Suso, E. Hawkins, and G. Green.

Harold B. Husted, P.E.
Youngstown, Ohio

¶ Youngstown University science building. (struc.) $1.2 million. Client, Kling & Frost, Architects.

Clauer Associates
Wooster, Ohio

¶ Recreation center, natatorium, administration building, dressing rooms, concession stand, and outdoor pool. Reinforced concrete, brick, steel joists, steel deck, laminated wood arches, and wood deck over inside pool. Bituminous concrete driveway and parking lot. Complete plans for client; location, West Richfield,



details make the difference

MODULAR SIGHTRON: A new *4-foot* molded styrene diffuser for a smooth line of light... new *hidden hinges* for easy maintenance and positive locking... neat and clean end detail with no exposed screws, no cluttered construction. It is exclusive and carefully designed details like these that add so much to the finished appearance and performance of lighting in your commercial interiors. You'll find that Modular Sightron's glare-free illumination is ideal for office, store, school, hospital corridors and utility areas. For a 120-PAGE CATALOG-BINDER fully detailing the architectural collection, write today to Dept. CE-39.

LIGHTOLIER

ARCHITECTURAL LIGHTING • RESIDENTIAL FIXTURES • PORTABLE LAMPS

MAIN OFFICE AND FACTORY: JERSEY CITY 5, NEW JERSEY

See all the newest Lightolier designs at these authorized distributors:

ALABAMA
Birmingham: Mayer Elec. Sup. Co.

ARIZONA
Phoenix: Brown Wholesale Elec.

CALIFORNIA
San Francisco: California Elec. Sup. Co.

COLORADO
Denver: Central Elec. Sup.

CONNECTICUT
Bridgeport: B. M. Tower
Hartford: Beacon Light & Sup. Co.
New Haven: Grand Light & Sup. Co.
New London: United Elec. Sup. Co.
Stamford: Marie Co.

DISTRICT OF COLUMBIA
Maurice Elec. Sup. Co.
National Elec. Wholesalers
O. R. Evans & Bros.

FLORIDA
Miami: Farrey's Whsle. Hdwe. Co.

GEORGIA
Atlanta: Atlanta Ltg. Fix.
Noland Co.

ILLINOIS
Chicago: Efengee Elec. Sup. Co.
Englewood Elec. Sup. Co.
Hawkins Electric
Hyland Elec. Sup. Co.
Wholesale Elec. Sup.
Elgin: Fox Elec. Sup.
Rockford: Englewood Elec. Sup. Co.
Springfield: Springfield Elec. Sup.

INDIANA
Ft. Wayne: Mossman-Yarnelle Co.
Gary: Englewood Elec. Sup. Co.
So. Bend: Englewood Elec. Sup. Co.

IOWA
Des Moines: Weston Lighting Co.

KANSAS
Kansas City: W. T. Foley Elec. Co.

KENTUCKY
Paducah: Ohio Valley Sup.

LOUISIANA
Baton Rouge: Electrical Wholesalers
New Orleans: Interstate Elec. Co.

MAINE
Bangor: Standard Elec. Co.
Portland: Holmes Elec. Supply Co.

MARYLAND
Baltimore: Excello Public Serv. Corp.

MASSACHUSETTS
Boston: Mass. Gas & Elec. Light Co.
Henry L. Wolfers Inc.
Fitchburg: Service Elec. Sup. Co.
Pittsfield: Carr Supply
Springfield: Eastern Elec. Sup.
Worcester: Atlantic Elec. Sup.
Benjamin Elec. Sup.

MICHIGAN
Detroit: Madison Elec. Co.
Michigan Chandelier Co.
Flint: Royalite Co.
Grand Rapids: Purchase Elec. Sup. Co.
Pontiac: Standard Elec. Co.
Saginaw: Standard Elec.

MINNESOTA
Duluth: Northern Elec. Sup. Co.
Minneapolis: Charles A. Anderson & Co.
Northland Elec. Sup. Co.
St. Paul: Lax Elec. Co.

MISSOURI
St. Louis: M. K. Clark

NEBRASKA
Omaha: Electric Fix. & Sup. Co.

NEVADA
Reno: Western Elec. Dists. Co.

NEW HAMPSHIRE
Portsmouth: Mass. Gas & Elec. Light Co.

NEW JERSEY
Atlantic City: Franklin Elec. Sup. Co.
Camden: Camden Elec. Fix. Co.

NEW MEXICO
Albuquerque: Albuquerque Dist. Co.

NEW YORK
Albany: Havens Elec. Co. Inc.
Binghamton: Eteije Elec. Sup. Co.
Buffalo: Buffalo Incan. Light Co. Inc.
Niagara Falls: Hysen Sup. Co.
Poughkeepsie: Electra Sup. Co.
Rochester: Rowe Electric Sup. Co.
Syracuse: Superior Elec.

NORTH CAROLINA
Charlotte: Independent Elec. Sup.
Durham: Noland Co.
Greensboro: Elec. Sup. & Equip. Co.
Kinston: Kinston Elec.
Winston-Salem: Noland Co.

OHIO
Akron: The Sacks Elec. Sup. Co.
Canton: The Electric Sales
Cincinnati: B. & B. Elec.
F. D. Lawrence Electric Co.
Cleveland: H. Leff Electric
Columbus: Elgee Elec. Co.
The Loeb Elec. Co.
Dayton: Duellman Elec. Co.
Toledo: Gross Elec.
Youngstown: Mart Industries

OKLAHOMA
Tulsa: Lawson Elec. Co.

PENNSYLVANIA
Allentown: Coleman Elec. Co.
Erie: Kraus Elec. Co.
Harrisburg: Fluorescent Sup. Co.
Hazleton: Power Elec. Co. Inc.
New Castle: Midwestern Elec. Co.
Philadelphia: Ace Lighting Fix. Co.
Gold Seal Elec. Sup. Co.
Sylvan Elec. Fix. Co.
Pittsburgh: Allied Elec. Sup. Co.
Argo Lite Studios
Doubleday-Hill Elec. Co.
Wally Elec. Sup. Co.
Reading: Coleman Elec. Co.
Scranton: Lewis & Reif
Wilkes Barre: Anthracite Elec. Sup. Co.

RHODE ISLAND
Pawtucket: Major Elec. Sup. Co.
Providence: Leavitt Colson Co.

SOUTH CAROLINA
Anderson: Sullivan Hdwe. Co.
Columbia: Capitol Elec. Sup. Co.
Noland Co.
Greenville: Sullivan Hdwe. Co.

SOUTH DAKOTA
Watertown: J. H. Larson Elec. Co.

TENNESSEE
Johnson City: Noland Co.
Nashville: Nashville Elec. Sup. Co.

TEXAS
Dallas: Rogers Elec. Sup.
Ft. Worth: Anderson Fixture Co.
Houston: Martin Associates
San Antonio: Southern Equip. Co.

VIRGINIA
Arlington: Dominion Elec. Sup. Co. Inc.
Noland Co.
Lynchburg: Mid State Elec. Sup. Inc.
Norfolk: Noland Co.
Roanoke: Noland Co.

WEST VIRGINIA
Charleston: Goldfarb Elec. Sup. Co.
Virginian Electric Inc.
Huntington: West Virginia Elec. Co.
Wheeling: The Front Co.

WISCONSIN
Appleton: Moe Northern Co.
Eau Claire: W. H. Hobbs Sup. Co.
La Crosse: W. A. Roosevelt Co.
Milwaukee: Lappin Elec. Co.
Standard Elec. Sup.

WASHINGTON
Seattle: Seattle Lighting Fix. Co.

ALASKA—*Anchorage:* Northern Supply Co.

CANADA
Montreal: The Gray Elec. Co.
Toronto: Revere Elec. Dist.
Toronto Elec. Sup. Co.

HAWAII
Honolulu: Hawaiian Light & Sup. Co.

now! the prints you need when you need them!

■ No longer need you wait a day, or even hours, for prints that you're in a hurry to get to customers.

Now, Bruning's unique Copyflex Model 300 brings the advantages of inside reproduction within the means of the smallest firm or department. Right in your own offices, you make sharp, black-on-white prints in seconds of a drawing or tracing up to 30 inches wide by any length. With intermediates, you make design changes without reworking originals; you make composite prints, color overlays, and sharp prints from weak originals. You add new dimensions in convenience, speed, and efficiency to your entire operation. All at the surprisingly low cost of the Model 300!

And anyone can operate the Model 300. It needs only a 115-volt AC connection . . . is clean, quiet, odorless. An 8½ x 11" print costs less than a penny for materials. The money and time you now spend for outside prints will pay for your new Model 300 in short order. Why not investigate?

BRUNING Copyflex

Low-cost Diazo Reproduction at Its Best!

Charles Bruning Company, Inc., Dept. 3-XX
1800 Central Road, Mount Prospect, Ill.
Offices in Principal U.S. Cities
In Canada: 105 Church St., Toronto 1, Ont.

Please send me my free booklet on the low-cost Copyflex Model 300.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

Summit County, Ohio. $350,000. Client, Great Lakes Swimming Association.

William Schuller
Toledo, Ohio
¶ Glendale Presbyterian Church, Toledo, Ohio. (struc.) $93,000. Client, Hoke & Nickerson, Architects.
¶ Sulphur Springs Clinic, doctor's building, Toledo, Ohio. (struc.) $51,000. Client, Richard F. Brown, Architect.
¶ Warehouse for Toledo Board of Education. (struc.) $179,000. Client, Hahn & Hayes, Architects.

Wayne A. Becker
Cincinnati, Ohio
¶ Steel plate swimming pool and wading pool, Dyer playground, Cincinnati Public Recreation Commission. Concrete decks and support walls; fill and draw type pools, no diving basin, no filter plant. $38,000. Client, City of Cincinnati, Ohio.

OKLAHOMA

Fred S. Dubin Associates
Hartford, Connecticut
¶ St. Gregory's monastery dormitory and refectory, Shawnee, Oklahoma. (mech.) $300,000; (elec.) $500,000. Client, Murphy & Mackey, Architects.

OREGON

Cornell, Howland, Hayes & Merryfield
Corvallis, Oregon
¶ Revisions to previous sewer study in light of growth of city and estimated growth of Oregon State College. Also preparation of preliminary design for flood pumping stations for winter flows. (civil) Client, City of Corvallis, Oregon.
¶ Sewer and sewage treatment study. Development of master plan to serve City of Salem, Oregon and surrounding areas and to provide secondary treatment. (civil, struc., mech., elec.) $2 million. Client, City of Salem, Oregon.
¶ Preliminary design of 500,000-gallon concrete reservoir for City of Yamhill, Oregon. (civil, struc.) $40,000. Client, City of Yamhill, Oregon.
¶ Study and design of fish rearing ponds in southwest Oregon. (civil) $30,000. Client, Salmon Unlimited, Inc.
¶ Soil density tests to determine compaction of fill for construction of housing project at Camp Adair, Oregon. (civil) $2.4 million (housing project). Client, U. S. Air Force.
¶ Study of site for earthfill dam on McClary Creek near Smith River, six miles northeast of Gardiner, Oregon. (civil) $30,000. Client, Salmon Unlimited, Inc.

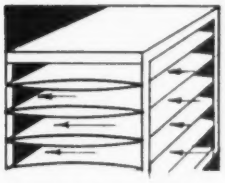
PENNSYLVANIA

H. G. Metzger Jr. & Associates
Huntingdon Valley, Pennsylvania
¶ Supermarket and parking lot, Bustleton shopping center, Philadelphia, Pa., plumbing and drainage. (mech.) Client, Charles Simons Co., Owner.
¶ Rockledge Plaza shopping center, Rockledge, Pa. Plumbing, heating, and air

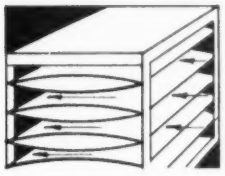
from CONNOR . . .

new in '58–the helical spring damper

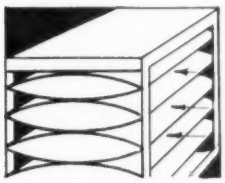
NOW in '59
PNEUMAFOIL®



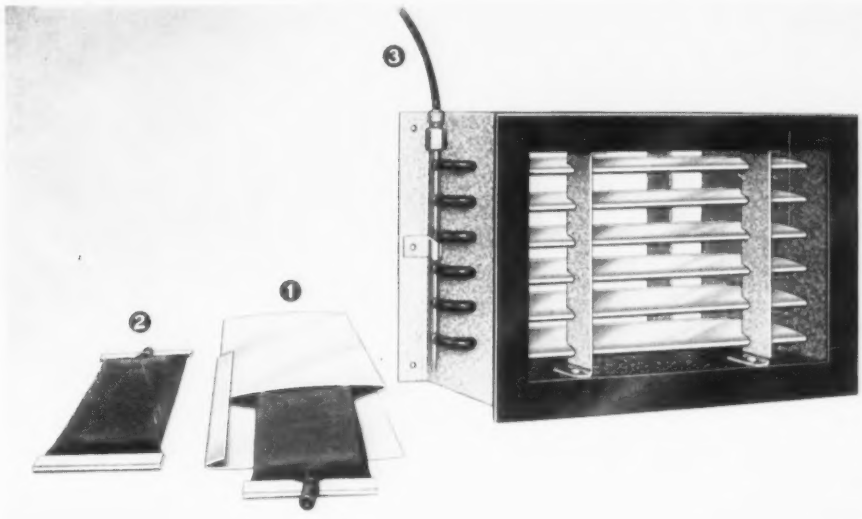
Pneumafoil has no linkage mechanism to actuate its vanes (1). Instead, each vane is occupied by a sealed neoprene actuator (2) connected to control air (3).



As air pressure is modulated between 0-15 psi, the actuator—literally lung-like in its pneumatic capacity—inflates, and expands the vanes; thereby producing throttling action by effectively diminishing the open area through which air can flow.



Achieving complete shutoff, all vanes make contact, allowing only negligible air leakage.



a pneumatically actuated high velocity air valve

PNEUMAFOIL is new in ways which are clearly beneficial to the design and function of a high velocity system, offering pronounced advantages of efficiency and economy over valves differently designed.

. . . new in DESIGN through which—for the first time—*pneumatic actuation* entirely eliminates the need for air motors and linkage mechanism in a rectangular high velocity air valve.

. . . new in CONSTRUCTION which employs streamlined air foil type aluminum vanes to minimize noise caused by air turbulence.

. . . new in CONTROL which is unprecedented in its operation directly by a standard pneumatic thermostat or constant volume regulator (both supplied by a 15 psi system).

. . . and extensive laboratory tests proved these Pneumafoil valves to have the incredible service life of twenty years!

DUAL DUCT SYSTEM ADAPTABILITY.

Available in 16 sizes, Pneumafoil also is the basic component in a new line of dual duct valve attenuators which range in air delivery from 1500 to 9600 cfm. Additionally, for fixed setting by manual adjustment, Connor offers MANUFOIL, which has a linkage mechanism and the same air flow characteristics of Pneumafoil.

For data on dimensions and capacities of this equipment, request Bulletin K-42.

Connor claims no corner on producing components of significantly advanced and beneficial design . . . but with Pneumafoil, Connor again demonstrates that its engineers constantly are developing equipment which assures the air conditioning industry and its customers of continued progress and growth.

CONNOR . . . for Constant Comfort Conditions

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

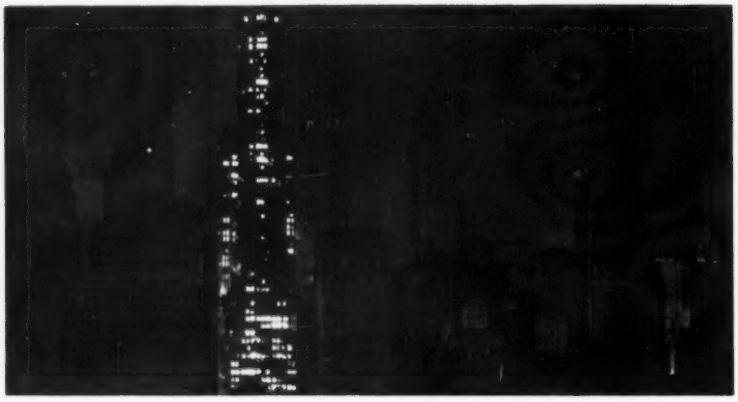
CONNOR ENGINEERING CORPORATION

kno·draft®

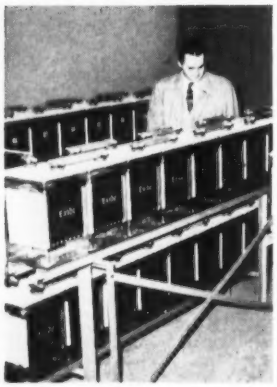
high velocity air diffusers

The building equipped with Exide Emergency Lighting

KEEPS ITS LIGHT



EVEN WHEN POWER FAILS



Your own power source. High-capacity Exide batteries handle lighting loads for entire buildings. Long-lasting—as much as 25 years in many installations.

No building is ever *safe* from power failure. But an Exide Emergency Lighting system can keep it safe from loss of light. If regular power fails, Exide power takes over—automatically. Keeps lights on. Prevents accidents, panic, damage, theft. Low cost protection for modern buildings. Get full details. Write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

conditioning. (mech.) $150,000 (total). Client, Paul G. Kunnle, Arch.
¶ Survey of heating and ventilating systems. (mech.) Client, George K. Garrett Co., Philadelphia, Pa.
¶ Renovations to water supply systems, Penn Packing Co., Philadelphia, Pa. (mech.) $5000. Client, Penn Packing Co.

David R. Wittes
Philadelphia, Pennsylvania
¶ Delaware Valley motor lodge, 72 units, precast concrete. (struc.) $350,000.

Eugene J. Aufiero
Harrisburg, Pennsylvania
¶ First Federal Savings & Loan, Harrisburg, Pa. (struc.) $200,000. Client, Ralph E. Spahr, Architect.
¶ Revisions to Steelton Branch, Harrisburg Trust Co., Steelton, Pa. (struc.) $100,000. Client, Duryea Cameron, Arch.

Roushey, Smith & Uhlmann
Wilkes-Barre, Pennsylvania
¶ Main office building relocation to building with new fluorescent lighting, air conditioning. (struc., mech., elec.) $275,000. Client, Glen Alden Corp.

RHODE ISLAND

Fred S. Dubin Associates
Hartford, Connecticut
¶ Brown University computer center, Providence, Rhode Island. (mech., elec.) $3 million. Client, Philip Johnson Associates, Architects.

SOUTH CAROLINA

The Harwood Beebe Company
Spartanburg, South Carolina
¶ Supply mains, pumping station, distribution mains. (civil) $434,000. Client, Cowpens Water District, Cowpens, S. C.
¶ 10-in. outfall sewage pumping station and 1-mgd sewage treatment plant with some collection lines. (civil) $400,000. Client, Commissioners of Public Works, Easley, South Carolina.

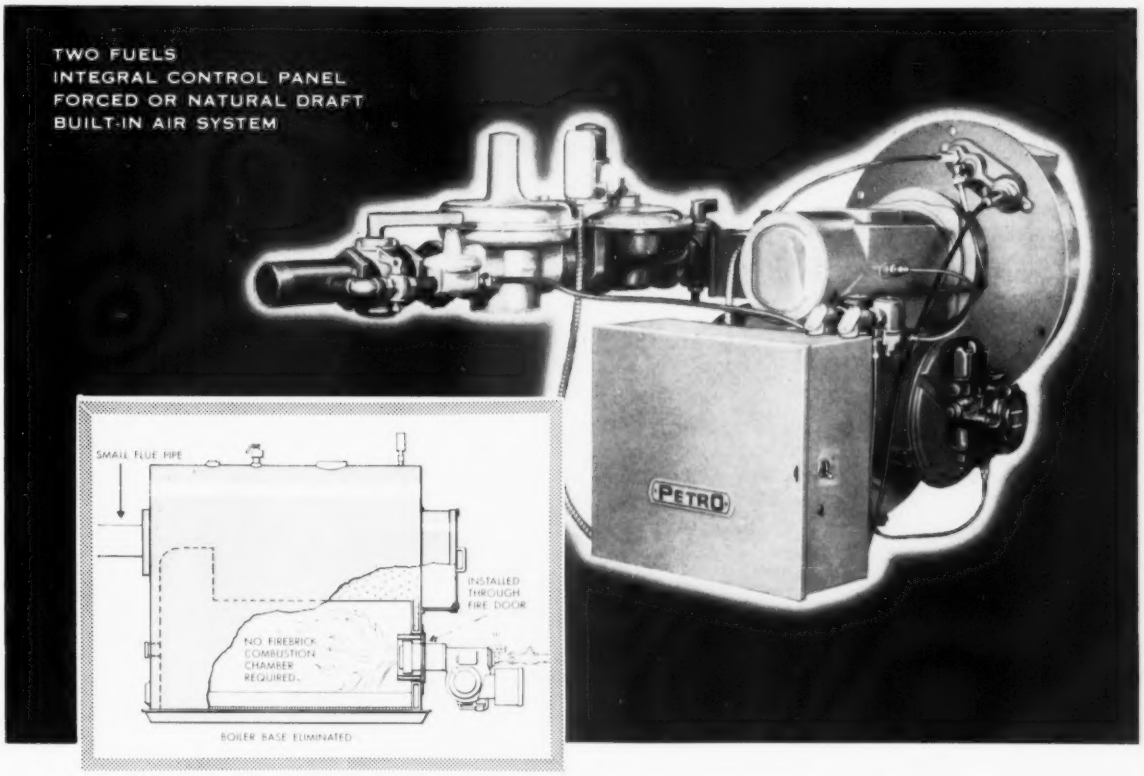
SOUTH DAKOTA

Arthur S. Mannes
Aberdeen, South Dakota
¶ 32,000 feet of 24-in. water transmission line. (civil) $550,000. Client, City of Aberdeen, S. D.

TENNESSEE

William F. Appleton
Kingsport, Tennessee
¶ Holiday Inn Motel and restaurant, Bristol, Virginia-Tennessee. 88 rental units in two 2-story buildings and restaurant with vestibule, lobby, lounge, motel manager's and clerk's offices, two main floor dining rooms, lower lobby, three banquet rooms, club room, three party rooms, two kitchens and food preparation rooms, bar, and restroom facilities. Completely air conditioned with television, music system, and telephone service to each room. Fireproof construction of masonry walls, concrete floors,

New all-in-one burner *bolts to boiler front*



Average installation saving in firebox boilers: $250

Substantial savings in installation costs are made possible in a firebox boiler by the elimination of the boiler base and fire brick combustion chamber. Fits any boiler; bolts to the boiler front. Complete forced draft, fuel and control systems are built into the burner. No secondary air construction needed.

Also available as boiler-burner unit

Packaged boiler with integral burner can be delivered at site, ready for service connections. No brickwork, pit, or special setting required.

No high stack needed

In a sealed fire box no stack is required; merely a vent. Air is supplied under forced draft. In conventional boilers the stack can be shorter and smaller than required by the usual gas or oil burner.

Switches fuels instantly

Burns either fuel with high efficiency. Saves purchase of extra burner in areas where gas users must provide standby oil equipment. One-fuel models are also available for either gas or oil.

Cuts fuel costs

New type of burner head and improved fuel-air control develops exceptional combustion efficiency. Instant heat absorption. No wasteful refractories to heat up.

Costs less to operate

Requires no more supervision than a domestic burner. Maintenance problems are negligible, and can usually be handled by the janitor.

Capacities: oil, 4 to 30 gph; gas, 500,000 to 4,000,000 btu/h.

Send coupon for full description and specifications

Makers of Quality Heating and Power Equipment since 1903

PETRO

T. M. REG. U. S. PAT. OFF.

- PETRO, 3319 W. 106th Street, Cleveland 11, Ohio
  (In Canada: 80 Ward Street, Toronto, Ontario)
- Please send complete information on Petro P-240 dual-fuel burner and boiler-burner units.
- Name
- Company
- Address
- City State

James Thurber's

MANY MOONS

Mr. Thurber made special arrangement for publication of this limited edition—one of his favorite stories. 21 woodcuts in many colors, by Philip Reed. Hand-set type; full blue cloth, gold stamped. Per copy, postpaid: $12.50. Hand-bound, full blue leather: $25. A perfect gift for young and old! Send orders, with remittance, to A. & R. Roe, *Publishers*, Saint Joseph, Michigan, or ask for illustrated descriptive broadside.

SERVICES FOR CONSULTING ENGINEERS

M. W. KELLOGG

Piping System Flexibility Analyses

SEND FOR BOOKLET
DESCRIBING THIS SERVICE

THE M. W. KELLOGG COMPANY
711 Third Avenue, New York 17, N. Y.

AMERICAN AIR SURVEYS INC.

Aerial Topographic Maps
Aerial Photos & Mosaics
for
• highways • city engineering
• subdivisions • airports • mining
907 Penn Ave., Pittsburgh 22, Pa.
Reps.—Chicago—Huntington, W. Va.

RANNEY METHOD WATER SUPPLIES, INC.

Ranney-Collectors Vertube Wells
Ranney Galleries Intakes
Engineering Service Available to Consulting Engineers and Architects
Descriptive Film Available
841 Alton Ave.
PO Box 5445 Columbus 19, Ohio

THE HINCHMAN CORPORATION
ENGINEERS
CORROSION ENGINEERING
Surveys — Designs — Reports — Specifications
UNDERGROUND UTILITIES
Location, mapping, electronic leakage surveys, Electrolysis surveys, electrical grounding systems.
Francis Palms Building, Detroit 1, Michigan

Experience Counts: Dependable Aerial Photos and Topographic Maps for Engineering Planning and Development—Anywhere in the World!

AERO SERVICE CORPORATION
Philadelphia 20, Pa.
Oldest Flying Corporation in the World • Founded 1919

folded concrete slab roof. Off-street parking, paved terraces, swimming pool, golf putting greens heated (snow melting systems) and lighted for night use. Clients, Holiday Inn Corp. and Morris Ross and J. E. Trayer Restaurants.

¶ Three-story and mezzanine building located at Kingsport, Tennessee. Drug store and tearoom on first floor, offices above. Brick, block, and glass curtain wall, fireproof construction, with elevator. (elec.) $400,000 (est.). Client, George and Howard Earle, Kingsport, Tenn.

¶ Sprinkler installation for manufacturing building at Greeneville, Tenn. $5000. Client, S. E. McAmis, Kingsport, Tennessee.

TEXAS

Halsey & Royer
San Antonio, Texas

¶ St. Luke's Episcopal parish hall. (mech., elec.) $348,416. Client, Henry Steinbomer, Architect.

¶ Sunshine Cottage. (mech., elec.) $67,000. Client, Julian & White, Architects.

¶ Incarnate Word high school chapel. (mech., elec.) $150,371. Client, Julian & White, Architects.

¶ Incarnate Word College dormitory and student center. (mech., elec.) $536,000. Client, Julian & White, Architects.

¶ Yoakum high school. (mech., elec.) $64,000. Client, DiStefano and Cerna, Architects.

¶ Yoakum junior high school. (mech., elec.) $88,000. Client, DiStefano & Cerna, Architects.

¶ De Tar Memorial Hospital. (mech., elec.) $63,000. Client, DiStefano & Cerna, Architects.

¶ Seguin high school. (mech., elec.) $165,000. Client, Julian & White, Arch.

¶ Gonzalez office building. (mech., elec.) $394,000. Client, Will Noonan, Architect.

¶ Store building. (mech., elec.) $115,000. Client, M. G. Simons, Architect.

¶ Highland Park Lutheran Church. (mech., elec.) $240,000. Client, M. G. Simons, Architect.

¶ Grace Lutheran Church. (mech., elec.) $500,000. Client, Ed Nicholson, Architect.

¶ First Church of Christ Scientist. (mech., elec.) $154,000. Client, Henry Steinbomer, Architect.

Charles R. Haile Associates, Inc.
Houston, Texas

¶ Sewage treatment plant and interceptor lines. (civil) $375,000. Client, Galveston County W.C. and I.D. No. 7, Hitchcock, Texas.

Hedrick & Stanley
Fort Worth, Texas

¶ Clark's Department Store, Fort Worth, Texas. 100,000 square feet. (civil, struc., mech., elec.) $1 million. Client, Dumas Milner Interp.

¶ 15-story Gulf Oil building, Midland, Texas. (civil, struc., mech., elec.) $2 million. Client, Dumas Milner Interp.

¶ Jones Stadium expansion, Texas Tech College, Lubbock, Texas. Move existing stadium, excavate field for additional seating capacity, new press box, lighting, sound system, and athletic building. (civil, struc., mech., elec.) $1.6 million. Client, Texas Tech College.

F. M. Hollandsworth
Wills Point, Texas

¶ Approximately 6.4 miles of 12.47/7.2 kv new line construction; 19.2 miles of 24.9/14.4 kv new line construction; 10.4 miles of line conversion; 2.6 miles of line removal. (elec.) $120,000. Client, Fannin County Electric Cooperative, Inc.

VIRGINIA

Fortune Engineering Associates
Alexandria, Virginia

¶ Fink office building, Falls Church, Virginia. Steel frame, steel joist floors, 6 stories. (struc.) Client, Ronald Senseman, Washington, D. C.

¶ Alexandria Hospital, Alexandria, Virginia. First stage, 157 beds, concrete frame. (struc.) $3 million. Client, Jos. Saunders & Associates, Alexandria, Va.

L. E. Wooten and Company
Raleigh, North Carolina

¶ Outside plant and central office equipment additions, Amherst County, Virginia. (telephone) $500,000. Client, Central Virginia Telephone Co.

Fortune Engineering Associates
Alexandria, Virginia

¶ Gibson warehouse, steel frame, metal roof, office mezzanine, Washington, D. C. (struc.) $520,000. Client, Vosbeck & Ward, Alexandria, Va.

WASHINGTON

Sitts & Hill
Tacoma, Washington

¶ Training Center, Ft. Lewis, Washington. (civil, struc., mech., elec.) $300,000. Client, U.S. Army Corps of Engineers, Seattle District.

WEST VIRGINIA

L. E. Wooten and Company
Raleigh, North Carolina

¶ Outside plant and central office equipment additions, Preston, Taylor, and Barbour Counties, West Virginia. (telephone) $710,000. Client, United Utilities of West Virginia, Davis, W. Va.

WISCONSIN

Collings-Vranich & Associates, Inc.
Milwaukee, Wisconsin

¶ Harbor terminal bridges, City of Milwaukee. Structural steel superstructure, pile substructure, steel bridge deck, asphalt roadway deck, partial lift bridges, machinery pits. Lake Michigan harbor front. (civil, struc.) Client, City of Milwaukee, Wisconsin.

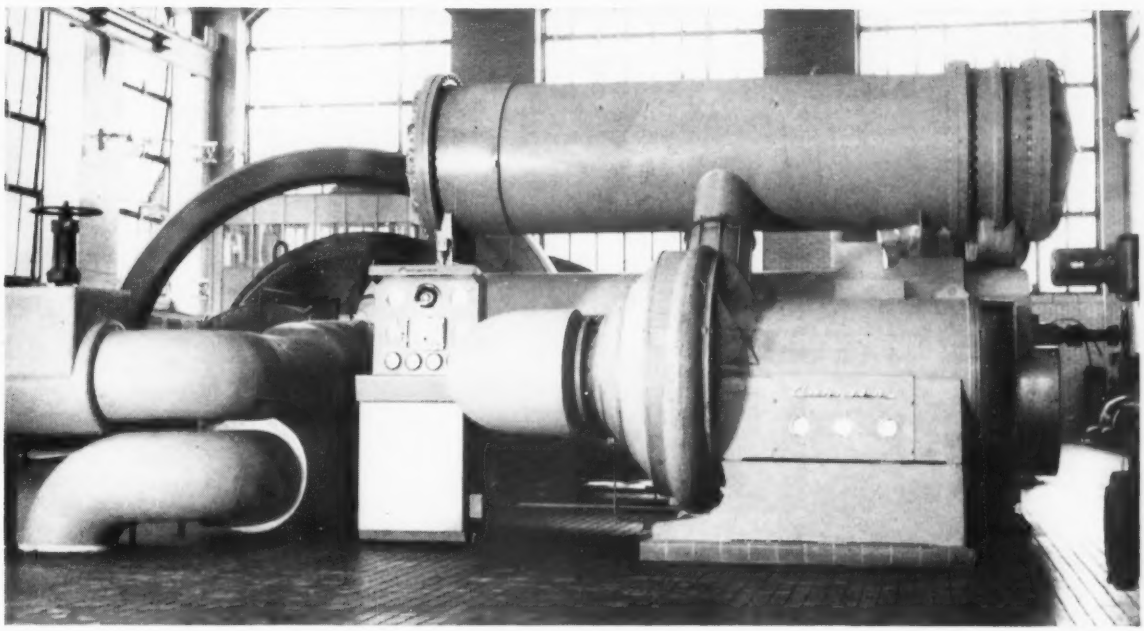
J. D. Hurley Engineering Service
Brookfield, Wisconsin

¶ Design and construction of Cedar Lake residence. (civil, struc., mech., elec.) $27,000. Client, Robert F. Stuth. ▲▲

Carrier
Hermetic Centrifugal Refrigerating Machines

now in a complete range of sizes

90 to 1500 tons



Carrier Hermetic Centrifugal Machines are available in a wide range of capacities in each size, with a choice of motor horsepowers and voltages, to meet the most exacting refrigeration load requirements in air conditioning and process cooling applications. In addition to economical selection with performance matched to specific job conditions, the Carrier Hermetic Centrifugal offers important advantages:

It combines weight savings, space savings and efficiency better than ever before achieved in a large refrigerating machine.

It runs smoothly and quietly; can be located on the roof of a building or in the basement without a heavy or costly foundation.

It operates economically. Capacity and power input are adjusted to the load, continuously, by inlet capacity vanes that are positioned, as required, by the hydraulic pressure of the lubricating oil.

It is automatic. After simple push-button starting, electronic controls provide continuous, automatic chilling of water to the desired temperature.

It has mechanical simplicity. The motor-compressor unit, hermetically sealed against air, moisture and refrigerant loss, is factory assembled on a single shaft.

Whatever your refrigeration requirements, there is a Carrier specialist in your area to assist you with the selection.

For detailed information about the Carrier Hermetic Centrifugal Machines, just call the Carrier district or branch office nearest you, or write to us at Carrier Corporation, Syracuse, New York.

Carrier air conditioning · refrigeration · industrial heating

FITZGIBBONS

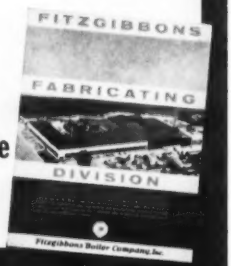
has the plant—over 250,000 sq. ft., equipment, experience—since 1886, and location to economically make and ship your

FABRICATED PLATE PRODUCTS

TYPICAL PRODUCTS
. . . fabricated from carbon, stainless and clad steels, and wrought iron.

- Large O.D. Pipe
- Cylindrical Pilings
- Stacks (Guyed & self-supporting)
- Coal Bunkers
- Caissons
- Dredge Hulls, Pipe & Equip.
- Barges
- Penstocks & Flumes
- Steel & Alloy Plate Construction
- Tanks, Drums & Towers

WRITE for New Brochure FB-16



FITZGIBBONS
FABRICATING DIVISION
FITZGIBBONS BOILER CO., INC.
Oswego, New York

Consulting Engineers' Calendar

March 3-5. American Institute of Electrical Engineers; Western Joint Computer Conference, Fairmont Hotel, San Francisco, California.

March 8-12. American Society of Mechanical Engineers; Gas Turbine Power Conference and Exhibit, Netherlands-Hilton Hotel, Cincinnati, Ohio.

March 15-18. American Institute of Chemical Engineers; National Meeting, Haddon Hall, Atlantic City, N.J.

March 16-20. National Association of Corrosion Engineers; Annual Conference, Hotel Sherman, Chicago, Illinois.

March 29-April 1. American Society of Mechanical Engineers; Instruments and Regulators Conference, Case Institute of Technology, Cleveland, Ohio.

March 31-April 2. Illinois Institute of Technology; Twenty-First American Power Conference, Hotel Sherman, Chicago, Illinois.

April 5-10. Engineers Joint Council; Nuclear Congress, Municipal Auditorium, Cleveland, Ohio.

April 6-8. Building Research Institute; Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania.

April 16-17. American Institute of Electrical Engineers; Electrical Problems in the Cement Industry Conference, Allentown, Pa.

April 19-23. American Society of Mechanical Engineers; Oil and Gas Power Conference, Shamrock-Hilton Hotel, Houston, Texas.

April 28. Association of Consulting Chemists and Chemical Engineers, Inc.; Symposium and Banquet, Shelburne Hotel, New York, N. Y.

May 4-6. Construction Specifications Institute; National Convention, Palmer House, Chicago, Illinois.

May 4-8. American Society of Civil Engineers; Cleveland Convention, Hotel Cleveland, Cleveland, Ohio.

May 11-13. American Society of Mechanical Engineers, American Institute of Electrical Engineers, Institute of Radio Engineers; Joint Automation Conference, Pike Congress Hotel, Chicago, Illinois.

May 20-21. Building Research Institute; Conference on Building Illumination, Statler-Hilton Hotel, Cleveland, Ohio.

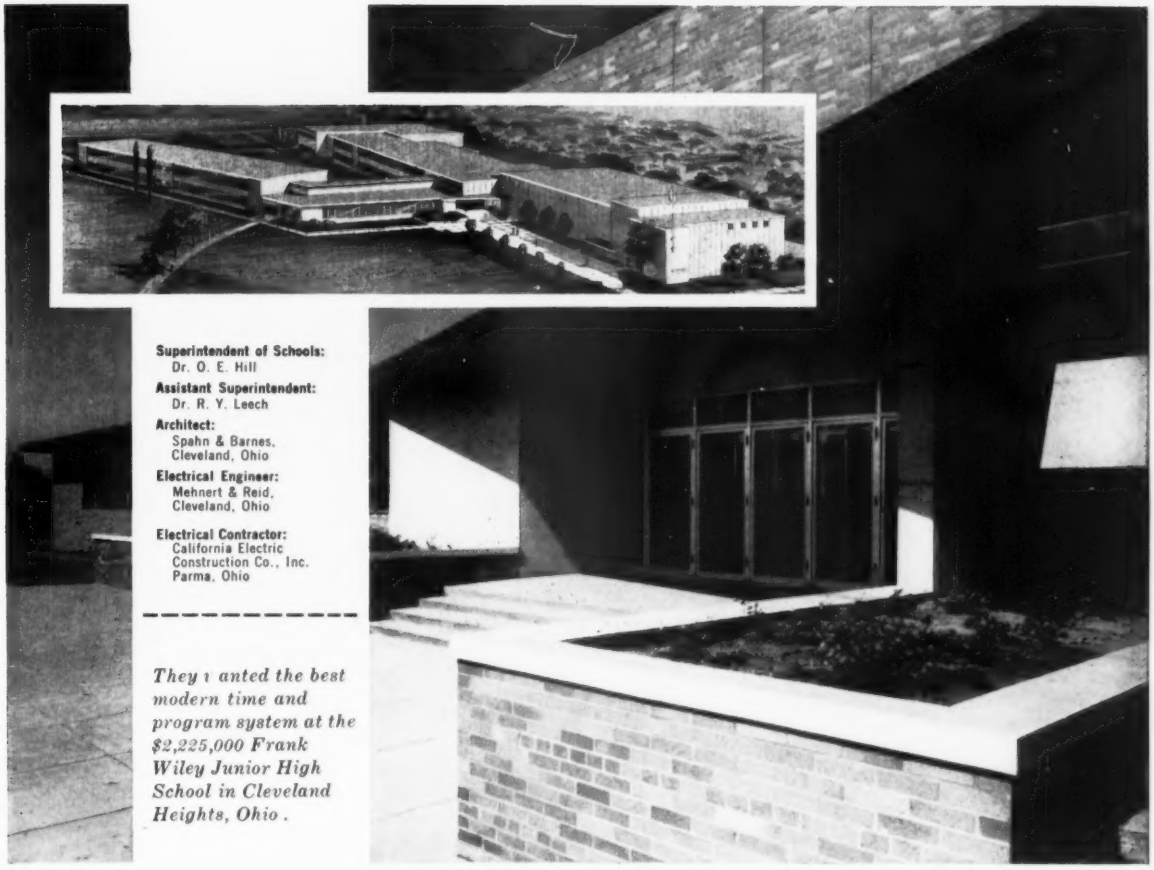
May 20-22. American Society of Civil Engineers; Jet Airport Conference, Shamrock-Hilton Hotel, Houston, Tex.

June 14-18. American Society of Mechanical Engineers; Semiannual Meeting, Chase-Park Plaza, St. Louis, Mo.

June 17-20. National Society of Professional Engineers; Annual Meeting, Commodore Hotel, New York, N.Y.

June 21-26. American Institute of Electrical Engineers; Summer and Pacific General Meeting, Olympic Hotel, Seattle, Washington.

June 22-23. Illuminating Engineering Society; Great Lakes Regional Conference, Statler Hotel, Buffalo, N.Y.



Superintendent of Schools:
Dr. O. E. Hill

Assistant Superintendent:
Dr. R. Y. Leech

Architect:
Spahn & Barnes,
Cleveland, Ohio

Electrical Engineer:
Mehnert & Reid,
Cleveland, Ohio

Electrical Contractor:
California Electric
Construction Co., Inc.
Parma, Ohio

They wanted the best modern time and program system at the $2,225,000 Frank Wiley Junior High School in Cleveland Heights, Ohio.

They chose a STROMBERG Time and Program System

FEATURES OF STROMBERG SYSTEMS INCLUDE:

- Jeweled Master Clock movement with automatically wound 72-hour spring power reserve.
- Secondary Clocks standard with hourly and 12-hour supervision—correction cycles completed in *only 60 seconds.*
- Program Unit, capable of 1440 signals daily on each circuit, immediately resets following power interruption.
- Central operations panel for control of utilities.
- Seven-channel transmitter—one for clock supervision, six for program signals.
- Installation and maintenance service available throughout U.S.A. and Canada.

A product of the laboratories of one of the largest clock manufacturers in the world—YOUR GUARANTEE of performance, quality and dependability.

A complete catalog—TIME AND SIGNAL EQUIPMENT—prepared especially for Architects and Engineers—is yours for the asking.

Stromberg TIME CORPORATION

ELM STREET, THOMASTON, CONNECTICUT

GT GENERAL TIME

SUBSIDIARY OF GENERAL TIME CORPORATION

Sales & Service Offices throughout the U. S. A.

ADVERTISERS' INDEX

Acme Industries, Inc. 166-167
Advance Transformer Co. 2nd Cover
Aerofin Corp. 134
Aget Manufacturing Co. 180
Air Preheater Corp., The 201
Allen Manufacturing Co., W. D. 204-205
American Gas Association 26-27
American Gilsonite Co. 125
American Vitrified Products Co. 24
Appleton Electric Co. 197
Armco Drainage & Metal Products, Inc. 133
Armstrong Machine Works 151
Asphalt Institute, The 40-41
Auth Electric Co., Inc. 216
Automatic Switch Co. 165

Baltimore & Ohio Railroad 88
Barber-Colman Co. 161
Barnebey Cheney 218
Barnstead Still & Sterilizer 210
Beatty Scaffold, Inc. 183
Bell & Gossett Co. 7
B-I-F Industries 12-13
Bilco Co. 172
Bituminous Coal Institute 194-195
Boiler Engineering & Supply Co., Inc. 131
Borden Metal Products Co. 145
Bruner Corp. 79
Bruning Co., Inc., Charles 230
Buensod-Stacey, Inc. 75
Buffalo Forge Co. 61
Burnham Corp. 213
Burt Manufacturing Co., The 228
Bussmann Mfg. Div. McGraw-Edison 192-193
Byers Co., A. M. 189
BYRNE Doors, Inc. 22
Byron Jackson Pumps, Inc. 83

Carrier Corp. Machinery & Systems Div. 235
Chrysler Corp. Airtemp Div. 89
Clarage Fan Co. 191
Cochrane Corp. 4th Cover
COLT Ventilation of America, Inc. 82
Combustion Engineering 154-155
Conco Engineering Works 212
Connor Engineering Corp. Commercial 231
Cook Co., Loren 132
Crouse-Hinds Co. 39
Curtis Manufacturing Co. Refrigeration Div. 211
Cyclotherm Div. National-U.S. Radiator Corp. 217

Day Brite Lighting, Inc. 214-215
DeBothezat Fans, A Div. of American Machine & Metals, Inc. 240
Detroit Stoker Co. Div. of United Industrial Corp. 6
Diamond Power Specialty Corp. 3rd Cover
Dow Corning Corp. 28
Dracco Div., Fuller Co. 153
Dunham-Bush, Inc. 147
Dur-O-wal Products, Inc. 77

Edwards Co., Inc. 30
Edward Valves, Inc. Subs. of Rockwell Mfg. Co. 142-143
EIMCO Corp. 46
Electric Machinery Co. 146
Electric Storage Battery Co. Exide Industrial Div. 232
Emhart Manufacturing Co. Maxim Div. 78
Everlasting Valve Co. 10

Federal Pacific Electric Co. 31
Fiese & Firstenberger Mfg., Inc. 29
Fischer & Porter Co. 173-174
Fitzgibbons Boiler Co., Inc. 236
Fluorescent Fixture Operation of Sylvania 8
Fuller Co. 239

Gallaher Co., The 170
General Chemical Div. Allied Chemical Corp. 181
General Electric Co. Apparatus Sales Div. 55
General Electric Co. Specialty Transformer Dept. 64-65
General Filter Co. 34
Globe Co., The Products Div. 80
Goodyear Rubber Co. 152
Gustin-Bacon Mfg. Co. 81
Guth Co., The Edwin F. 208

Hendrick Mfg. Co. 196
Hewitt-Robbins 44-45
Hills-McCanna Co. Proportioning & Metering Pump Div. 11

Irving Subway Grating Co., Inc. 37

Jeffrey Mfg. Co., The Industrial Div. 136
Jenn-Air Products Co., Inc. 221
Jerguson Gage & Valve Co. 158
Johns-Manville A.C. Duct Insulation 52-53
Johnson Service Co. 124

Kalamazoo Tank & Silo Co. Industrial Storage Bin Div. 68
Keasbey & Mattison Co. Pressure & Sewer Pipe 149
Kerrigan Iron Works, Inc. 62
Kliegl Bros. 130
Kohler Co. 76
Kunkle Valve Co. 60

Ladish Co. 87
Leffel & Co., The James 49
LENNOX Industries Inc. Industrial Div. 86
Leupold & Stevens Instruments, Inc. 200
Lightolier, Inc. 229
Liquidometer Corp. 190
Luddington Corp. 184

McPhilben Lighting Co. 160

Mahon Co., The R. C. 156-157
Marlo Coil Co. 129
Master Builders Co., The 175
Midwest Piping Co., Inc. 59
Miller Co. 21
Moloney Electric Co. 176-177

National Aluminate Corp. 67
Naylor Pipe Co. 199
Neo-Ray Products, Inc. 182
Nesbitt, Inc., John J. 38
NIBCO, Inc. 163

Onan & Sons, Inc., D. W. 148

Parkersburg Rig & Reel Building Div. 57
Pass & Seymour, Inc. 58

Peerless Electric Co. Fan & Blower Div. 50
Peerless Pump Div. Food Machinery & Chemical Corp. 219
Penn Ventilator Co. 225
Permacrete Products 164
Petro 233
Petrometer Corp. 16
Pittsburgh Piping & Equipment Co. 169
Powell Co., The William 43
Pritchard Co. of California 17
Pyle National Co., The 47

Reliance Gauge Column Co., The 4
Ric-wil, Inc. 3
RLM Standards Institute, Inc. 15
Robbins & Myers Propellair Div. 128
Rockwell Standard Corp. Grating Div. 162
Roebling's Sons Corp., John A. 203
Rockwell Co., W. S. 164
Rohm & Haas Co. 51
Rome Cable Corp. 32, 33, 62, 90, 150, 162
Roots-Connersville Blower A Div. of Dresser Industries, Inc. 19

S & C Electric Co. 227
Simplex Wire & Cable Co. 159
Southwestern Plastic Pipe Co. 18
Sparling Meters Co. 220
Speedline Stainless Steel Fittings, Div., Horace T. Potts Co. 223
Spencer Turbine Co., The 56
Square D Co. 84-85, 185
Standard Electric Time Co. 135
Stran-Steel Corp. 71
Stromberg-Carlson Co. Commercial Sound 224
Stromberg Time Corp. 237
Sumo Pumps, Inc. 74
Sun Chemical Corp. A. C. Horn Co. 178
Superior Combustion Industries Inc. 63
Swartwout Co., The 66

Tapecoat Co., The 144
Texsteam Corp. 202
Thermal Engineering Corp. 198
Thompson Electric Co., The 72
Titusville Iron Works Co. 23
Todd Shipyards Corp. Products Div. 152
Torit Mfg. Co. 90
Tranter Mfg. Inc. 69-70

U. S. Gauge, Div. of American Machine & Metals, Inc. 226
U. S. Steel Corp. AmBridge Steel Joists 9, 121

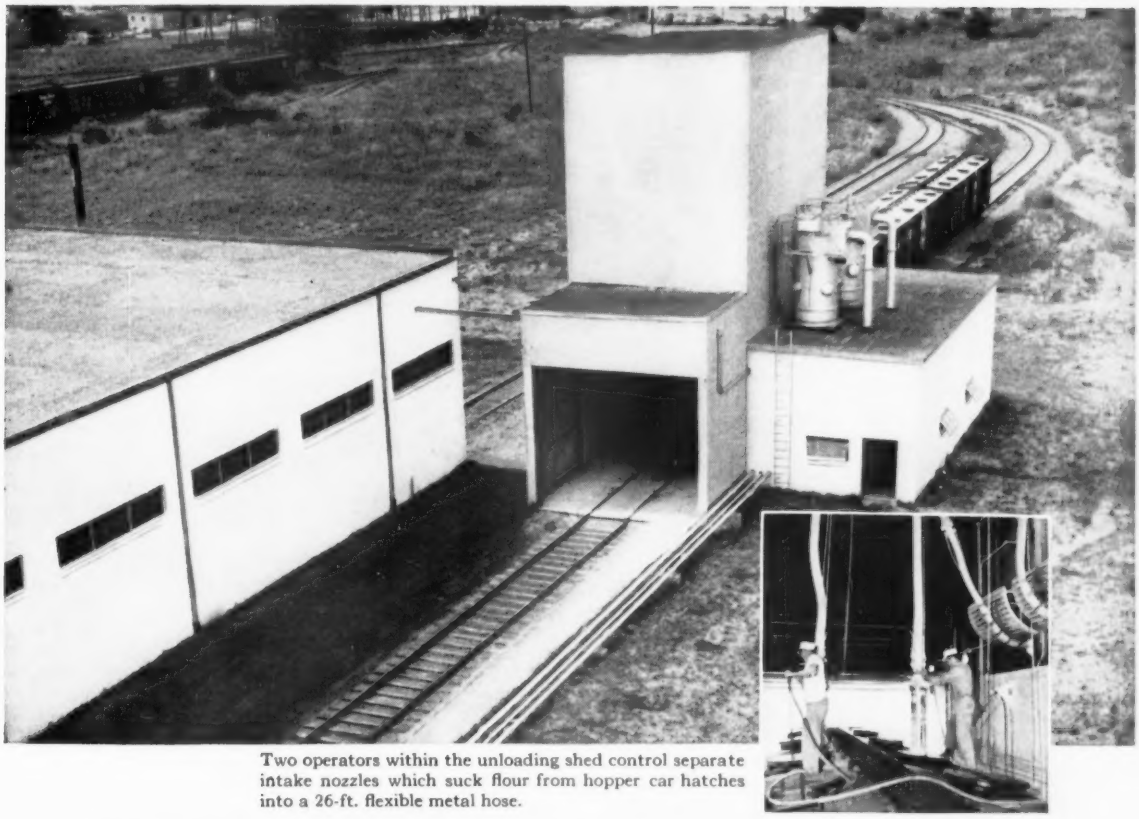
Viking Pump Co. 150
Vogt Machine Co., Henry 171

Weil-McLain Co. 187
Westinghouse Electric Corp. Agency & Construction 206-207
Motor & Control 141
Transformer 35-36
Whiting Corp. 25
Williams Equipment & Supply Co. 20
W-K-M, A Div. of ACF Ind., Inc. 73
Wright-Austin Co. 188

Yarnall-Waring Co. 91
York Corp. Subs. of Borg-Warner Corp. 179
Young Radiator Co. 222

Zenith Electric Co. 186

The Arithmetic of Materials Handling



Two operators within the unloading shed control separate intake nozzles which suck flour from hopper car hatches into a 26-ft. flexible metal hose.

Flexibility of FULLER Pneumatic Conveying Systems Makes Problem Plant Site Practical For General Mills

The proposed site of a new General Mills flour blending and packaging plant in Louisville, Ky. seemed impractical to mill engineers because of the site's long, narrow shape. Flour, delivered at a dead-end rail siding, would have to be conveyed over unusually long distances—400 feet from unloading point to storage bins.

By incorporating Fuller Airveyor® pneumatic conveying systems in the plant design, General Mills has overcome these disadvantages and has completed one of the country's most modern bulk flour handling plants.

At the new, highly-automated plant, Fuller Airveyors unload Airslide® or hopper cars of bulk flour at 40 tons an hour, flowing it 400 feet to a series of 18 silos. In a completely integrated system, other Fuller Airveyors deliver ingredients for blending, weighing, proportioning and bagging operations. The compact, 5-inch pneumatic pipelines twist and turn easily through what would be cramped or impossible quarters for other methods of conveying. Self-cleaning Airveyors, containing few moving parts, practically eliminate maintenance and industrial hazards.

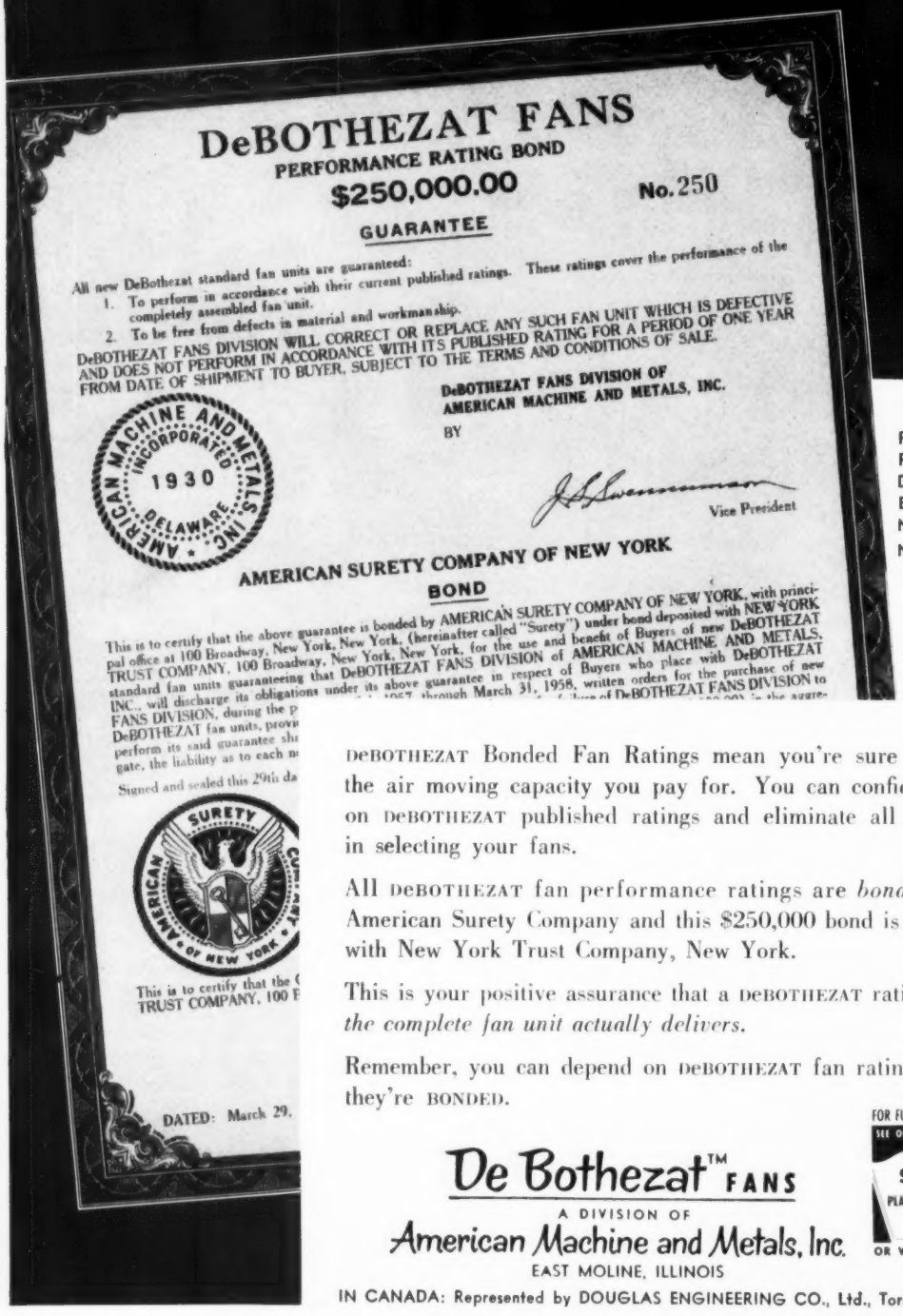
Production speed, flexibility, sanitation, processing accuracy, push-button control of an entire plant—are just some of the advantages of Fuller pneumatic bulk handling systems realized at General Mills' new Louisville plant. Similar advantages can apply to old plants modernized with the help of Fuller engineering specialists. Write or phone today outlining your problem. Fuller will gladly furnish additional information with appropriate recommendations. 1187 A-269

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
118 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • New York • San Francisco • Seattle

Fuller
....pioneers in harnessing AIR

$250,000 BOND ASSURES ACCURACY OF FAN RATINGS



DeBOTHEZAT FANS
PERFORMANCE RATING BOND
$250,000.00 No. 250

GUARANTEE

All new DeBothezat standard fan units are guaranteed:
1. To perform in accordance with their current published ratings. These ratings cover the performance of the completely assembled fan unit.
2. To be free from defects in material and workmanship.

DeBOTHEZAT FANS DIVISION WILL CORRECT OR REPLACE ANY SUCH FAN UNIT WHICH IS DEFECTIVE AND DOES NOT PERFORM IN ACCORDANCE WITH ITS PUBLISHED RATING FOR A PERIOD OF ONE YEAR FROM DATE OF SHIPMENT TO BUYER, SUBJECT TO THE TERMS AND CONDITIONS OF SALE.

DeBOTHEZAT FANS DIVISION OF
AMERICAN MACHINE AND METALS, INC.
BY
Vice President

AMERICAN MACHINE AND METALS, INC. INCORPORATED 1930 DELAWARE

AMERICAN SURETY COMPANY OF NEW YORK

BOND

This is to certify that the above guarantee is bonded by AMERICAN SURETY COMPANY OF NEW YORK, with principal office at 100 Broadway, New York, New York, (hereinafter called "Surety") under bond deposited with NEW YORK TRUST COMPANY, 100 Broadway, New York, New York, for the use and benefit of Buyers of new DeBOTHEZAT standard fan units guaranteeing that DeBOTHEZAT FANS DIVISION of AMERICAN MACHINE AND METALS, INC., will discharge its obligations under its above guarantee in respect of Buyers who place with DeBOTHEZAT FANS DIVISION, during the p... through March 31, 1958, written orders for the purchase of new DeBOTHEZAT fan units, prov... of DeBOTHEZAT FANS DIVISION to perform its said guarantee sh... in the aggregate, the liability as to each n...

Signed and sealed this 29th da...

AMERICAN SURETY COMPANY OF NEW YORK

This is to certify that the ... TRUST COMPANY, 100 ...

DATED: March 29, ...

Facsimile of actual Performance Bond behind DeBothezat fan ratings. Bond on deposit with New York Trust Company, New York.

DEBOTHEZAT Bonded Fan Ratings mean you're sure of getting the air moving capacity you pay for. You can confidently rely on DEBOTHEZAT published ratings and eliminate all guesswork in selecting your fans.

All DEBOTHEZAT fan performance ratings are *bonded* by the American Surety Company and this $250,000 bond is on deposit with New York Trust Company, New York.

This is your positive assurance that a DEBOTHEZAT rating is *what the complete fan unit actually delivers.*

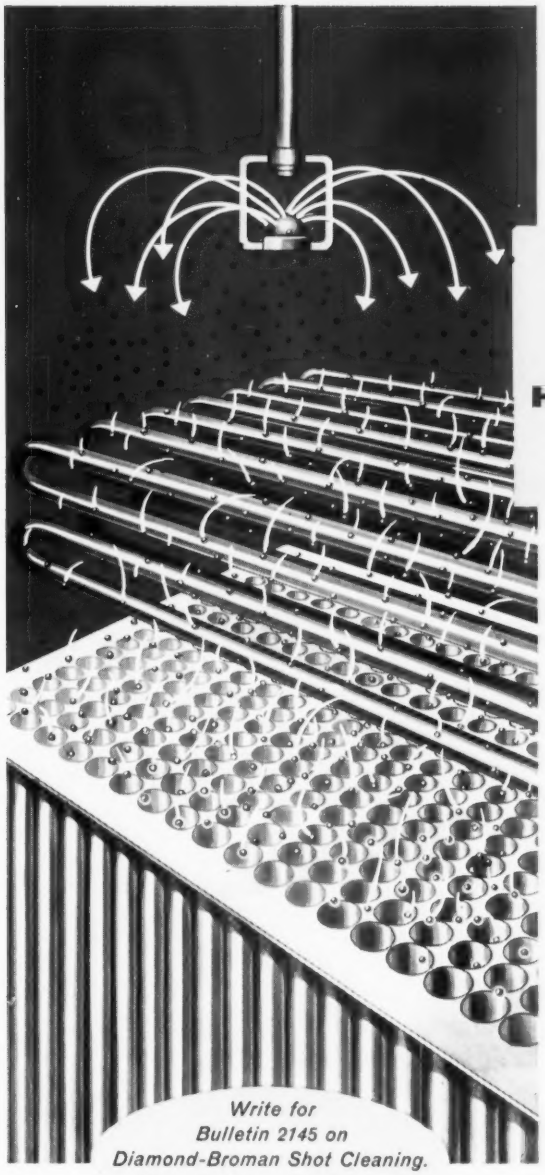
Remember, you can depend on DEBOTHEZAT fan ratings because they're BONDED.

FOR FURTHER INFORMATION
SEE OUR CATALOG IN
SWEET'S
PLANT ENGINEERING FILE
OR WRITE FOR COPY

De Bothezat™ FANS
A DIVISION OF
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

IN CANADA: Represented by DOUGLAS ENGINEERING CO., Ltd., Toronto • Montreal

Diamond SHOT CLEANING SYSTEM



Write for Bulletin 2145 on Diamond-Broman Shot Cleaning.

Diamond gives you better boiler cleaning at lower cost.

. . . Now Ready and Able to

IMPROVE THE CLEANING OF

TUBULAR AIR HEATERS
•
ECONOMIZERS
•
HORIZONTAL SUPERHEATERS
•
REHEATERS

Shot cascading over horizontal tubular surfaces and through vertical air heater tubes, does an excellent job of removing soot and ash deposits from difficult-to-clean surfaces and those which foul rapidly.

Shot Cleaning has proved itself in more than 30 installations in the United States and in more than 800 installations in Europe. Many installations represent exceptionally difficult cleaning problems such as tubular air heaters, economizers and superheaters in black liquor fired boilers in paper mills. In a large central station, the system is now keeping air heaters clean which previously had to be water washed approximately every eight months, each washing requiring a three day boiler outage. With Diamond Shot Cleaning, draft losses are uniformly low and water washing has been eliminated entirely.

Shot is spread by distributors and cascades over tube surfaces ricocheting from tube to tube, or from side to side of internal surfaces of vertical air heater tubes. Much of the ash removed is carried off by flue gas. Heavier particles fall into the shot hopper and recirculate with the shot until broken fine enough to pass out with the gases. Shot accumulated in the hopper is lifted pneumatically to the storage area and reused continuously. Areas which foul rapidly can be kept completely clean by increasing the length of the shot cycle (it can be continuous) without disturbing boiler operation.

Over a period of years Diamond has conducted extensive research in shot cleaning, as a part of our half century policy of providing the best in boiler cleaning. To supplement this program, Diamond acquired U.S. rights to the Broman-Ekstrom system used in Europe.

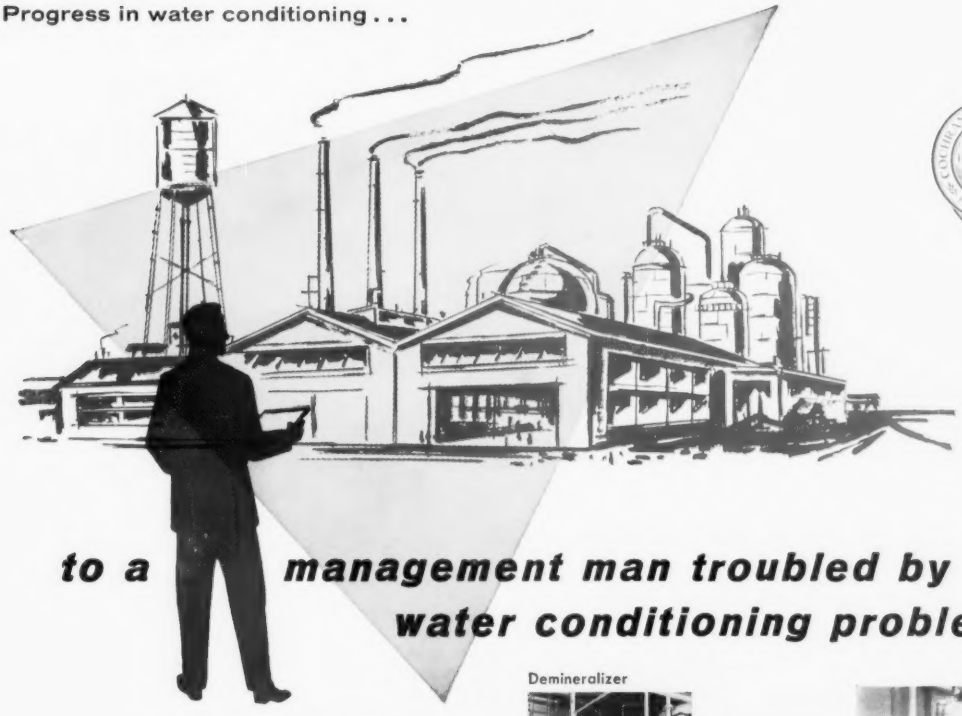
Diamond

DIAMOND POWER SPECIALTY CORP.

LANCASTER, OHIO

8265

Progress in water conditioning . . .



to a management man troubled by water conditioning problems . . .

Is your plant's water treatment system overloaded by new boilers, turbines or process equipment? Can your product be improved or made more uniform by higher quality water? Sometimes the only answer is to install a complete new system, but in many industrial plants Cochrane has been able to find far less costly solutions utilizing present equipment.

Cochrane is in a unique position to assist your staff in analyzing all approaches to your problem and selecting the most economical one. Its experience in water and heat engineering covers nearly a century and every industry from steel to pharmaceuticals and atomic power. Cochrane manufactures all types of water treatment equipment, assuring you of an unbiased recommendation. A Cochrane representative will be glad to discuss your problem with you or your staff. There is no obligation, simply call or write: Water Treatment Division.

Cochrane CORPORATION

3112 N. 17th Street, Philadelphia 32, Pa.

Philadelphia • New York • Chicago

Cochrane Water Conditioning, Limited, Toronto, Montreal, Winnipeg, Canada.

Representatives in thirty-two principal cities in U.S., Hawaii, Puerto Rico; also Havana, Cuba; Paris, France; La Spezia, Italy; Mexico City, Mexico; Caracas, Venezuela; Santiago, Chile; Manila, Philippine Islands.

POTTSTOWN METAL PRODUCTS DIVISION—
Custom built carbon steel and alloy products